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ILEOCECAL ADHESIONS ("LANE'S KINK" AND "JACKSON'S MEMBRANE")[1]

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APPENDECTOMY for chronic recurrent appendicitis or for symptoms attributed to such a condition is often followed by unsatisfactory results. The explanation obviously lies with either a mistaken diagnosis, or some overlooked complication, both of which, as is well known, may occur with great frequency in cases so diagnosed.

The ileal kink described by Lane (1) and the membranous pericolitis of Jackson (2) are perhaps the most recently described complications. These conditions may, of course, occur either with or without an appendicitis.

Mr. W. Arbuthnot Lane (3) in his classic studies of chronic intestinal stasis has called our attention to many acquired connective tissue bands that result in pathologic flexures in the intestinal tract, but the one referred to by the term "Lane kink" is found in the terminal ileum, usually within the last four inches and may assume various shapes; either an inverted or an upright "V," with the two limbs of the angle more or less intimately attached to each other.

Another type is a less acute angulation, with the concavity of the curve toward the head, in which there is also a rotation of the bowel upon its long axis. (Fig. 1.)

The membranous pericolitis will be best described by quoting from Hall in Jackson's article (2): "From a point just at the hepatic flexure to three inches above the caput there spreads from the parietal margin over the external lateral margin to the internal longitudinal muscle band a thin vascular veil in which long straight, unbranching blood-vessels course, most of which are parallel with each other and take a slightly spiral direction over the colon from the outer upper peritoneal attachment to the inner lower portion of the gut ending just above the caput. The appendix is not implicated in any way.

"Coursing with the blood-vessels are numbers of shining narrow bands of connective tissue which gradually broaden as they go and end in a slight fan-shaped attachment at various points on the anterior and inner surfaces of the colon. At these points of attachment, the gut is held in rigid plication.

"The entire specimen conveys to the eye the idea that an edematous fluid lies beneath this delicate membrane, and reminds one of nothing so much as an edematous arachnoid so often encountered on removing the dura mater from the brain of a dead alcoholic. The colon seems placed in a diaphanous bag slightly too short to contain it without wrinkling. At the beginning of the hepatic flexure the drawn membrane particularly angulates the contained colon. Here and there are spots and tags of fat beneath the cobweb. On handling the specimen the colon slips about in its bag without entire freedom, as

[1]Read before the State Medical Society of Wisconsin, June 8, 1911.

a fœtus within its amniotic sac. A portion of the parietal peritoneum has been removed with the colon and shows that the membrane and blood-vessels arise in and are continuous with the structures of the parietal peritoneum, as it sweeps over the colon. The entire structure seems to be peritoneum, loosened from its close connection to the abdominal wall and colonic surface by some serous exudate after which the particular vascularization and connective tissue banding has occurred as a chronic reaction to irritative influence." (Fig. 2.)

Hofmeister (4) describes veil-like adhesions, varying in density, that could be lifted up with forceps, and only after division of this delicate membrane did the true serous covering of the gut become exposed. Their consistency varies from that of a fine veil-like substance to firm strands of scar tissue. The constricting action of such bands could not be fully appreciated until one saw how the intestinal wall unfolded to its normal shape after their division.

Enlargement of the mesenteric lymph glands is mentioned by Hofmeister; in three of the writer's cases these were notably enlarged, but microscopic examination showed them to be due to chronic inflammatory hyperplasia.

This membrane has been previously observed and mentioned in literature, but Jackson was the first to describe it in detail, and to emphasize its importance as a pathological and clinical entity. Lane evidently deals with the same condition, but does not describe the characteristic membrane, speaking merely of "adhesions" which may be found in various locations, the ileocecal region, ascending colon, hepatic or splenic flexure, or the sigmoid, though he does not consider these to be the result of inflammation, as is the usual adhesion.

In Jackson's cases, he was able to find this membrane only in the region of the cecum and the ascending colon, while Hofmeister corroborates the findings of Lane.

Binnie (5) as early as 1905, under the title "pericolitis dextra" mentions this "delicate curtain or web of adhesions covering the cecum." Hofmeister gives credit to Virchow for first calling attention to this condition.

ETIOLOGY

That the ileal kink is caused by the descent of the cecum is generally admitted. F. H. Martin (6) reminds us that the lower ileum is comparatively fixed and that there are two factors leading to its distortion, a too movable or misplaced large bowel, or an abnormal disposition of the remaining small bowel or other viscera, concluding that it is safe to assume that the kink will not occur if large and small bowel are normal. Martin well points out the importance of the long continued traumatism of the comparatively fixed portion of the ileum by the overriding of the intestine and superimposed viscera. The descent of the cecum he explains as due to developmental failure of fusion between parietal and visceral peritoneum, resulting in general visceral enteroptosis, improper muscular development of the abdominal wall, persistence of a straight spine, and non-rotation of the pelvis to a position of right angle to the perpendicular of the spine.

Mr. Lane considers the ileal kink to be due to ptosis of the cecum, which in turn he attributes largely to the erect position of the trunk. He explains that this tendency of the

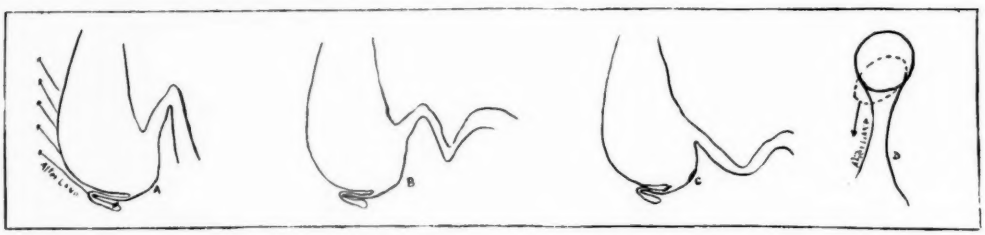

Fig. 1. A, B, C, various types of ileal kinks. D, sectional view of kink, showing rotation.

cecum to fall is met by crystallization of lines of strain into peritoneal adhesions, which form bands external to the cecum and ascending colon and fix these structures to the abdominal wall, frequently involving and distorting the appendix. The internal strain comes upon the termination of the ileum, and the posterior layer of its mesentery. In the latter region, a layer of peritoneum is formed that kinks the ileum in two planes, one being vertical and angular, the other being due to torsion, the combined rotation and angulation making a very effectual obstruction. The end of the ileum with the additional thickening and contraction of the posterior layer of the mesentery form an *internal*, or median, ligament which tends to keep the cecum out of the pelvis. The *external*, or lateral, ligament consists of the acquired plane of peritoneum which extends inward from the abdominal wall to the cecum, and ascending colon, with also the proximal portion of the appendix in some cases. The external acquired ligament of Lane is in many respects very similar to the membranous pericolitis of Jackson.

An essential cause of the membranous pericolitis is not generally accepted. Jackson frankly admits ignorance as to whether the ptosis antecedes and is followed by this condition, or whether the ptosis is a result.

Mayo (7) believes this membrane to be "due to the late rotation of the bowel and descent of the cecum from its hepatic position, after the formation of the parietal portion of the peritoneal cavity in the infant. The cecum burrows its way into position, as it were, through the peritoneum."

Such an explanation attributes to the cecum in its descent from the liver the rather unusual choice of the route of the greatest, instead of the least, resistance, and prompts the question, Why burrow behind an already formed posterior parietal peritoneum, when it would be much easier to descend in front of this structure in the usual manner?

After the removal of this adventitious membrane, the cecum and the colon usually has a mesentery, and can be brought well up into the abdominal wound. Were the explanation of Mayo correct, the caput cecum and the appendix would be enveloped by the veil, as this would be the entering wedge to force itself behind the peritoneum. But, as a matter of fact, the appendix and the lower part of the cecum are often not within the membrane, its lower margin being above the lowest point of the cecum.

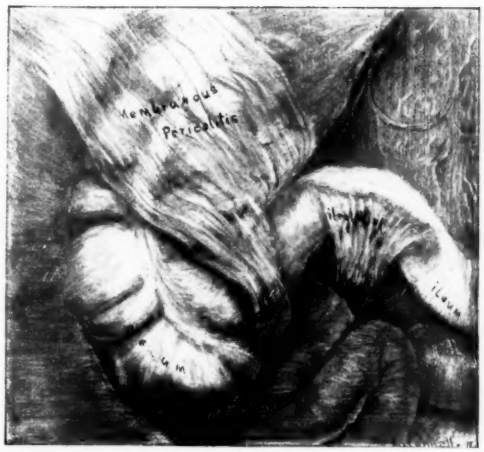

Fig. 2. Showing membranous pericolitis and ileal kink, one year after appendectomy.

Binnie considers it a primary pericolitis, the appendix, if involved, being secondary, and quotes Alglave, who attributes the entire change to nephroptosis.

Morris (8) in speaking of "gall spider cases" quotes the late Byron Robinson to the effect that adhesions were found in the bile tract region more frequently than elsewhere in the peritoneal cavity, excepting the pelvis in women; and that the cecal region stood third in order of abundance of adhesions.

Hertzler (9) has described a similar condition but considers it to be of inflammatory origin, either in the appendix or gall-bladder.

Hofmeister likewise considers the cause to be an inflammation of neighboring organs, such as the bile passages, stomach, or duodenum. He makes the report that in ten of his last fourteen cases the *trichocephalus dispar* was found. This observation is most interesting because of the fact that Metchnikoff and Guirat (10) both have suggested that the escape of intestinal bacteria along the fine passages made by this parasite is a probable

Fig. 3. Showing result after correcting kink and partial removal of membrane, which has been twisted into a cord, to be fastened to the abdominal muscle, keeping the cecum up and out of the pelvis.

cause of some cases of peritonitis and appendicitis.

Lennander believes that adhesions are chiefly the result of infantile colitis.

Chronic colitis is looked upon as a cause by many, and Fischler states that such an inflammation of the colon leads to muscular atony.

That the conditions under discussion are not inflammatory would seem to be indicated by their very definite localization. If due to appendicitis, the appendix should be constantly involved; if due to colitis, the median aspect of the colon should be equally involved.

Lane, Jackson, and Martin, all agree that these changes are not adhesions in the usual acceptance of the term. Lane goes so far as to say: "Nothing appears so absurd as the attempts of surgeons to make out that the inflammation of the appendix is a primary condition, and that it is productive of the other effects of intestinal stasis."

FREQUENCY

A definite statement as to the frequency of these conditions cannot be made, as the subject is comparatively new. Jackson met with nine cases of pericolitis in one year. In 1909, I encountered four of these cases, three in my own practice, and was a spectator at an operation by Dr. B. C. Gudden, of this city, where laparotomy was performed for chronic recurrent appendicitis, at which there was found a very distinct and definite pericolitis. This membrane was divided and the ileocecal junction brought up out of the abdomen, but despite a most painstaking and thorough search, the appendix could not be found.

Absence of the appendix is very rare, but in the article of Dailey twelve authentic cases are reported.

In 1910, I found this membrane in three cases. In 1911, to date, I have met with a pericolitis nine times (females 8, males 1; average age 20 years), and the ileal kink six times (females 4, males 2; one each 35, 21, 20, and three 18, years of age).

In two instances both the ileal kink and the pericolitis were combined in the same patient. Mayo says they are frequently combined. Of those thirteen cases, nine were met with while operating sixteen times for chronic recurrent appendicitis, and four in ten cases, in which it was thought advisable to remove the appendix during operations for other abdominal conditions. In one case, in which the symptoms were not relieved after the removal of the appendix, I have had the opportunity of performing a second operation, at which time both a membranous pericolitis and an ileal kink were discovered and remedied. These had in all probability been present before the first operation, as neither the omentum, the anterior abdominal wall, or the site of the appendical stump were involved in either of the adhesions. The condition found is well represented in Fig. 2.

(In another case in which there was no amelioration of the symptoms following appendectomy, I recently witnessed Dr. C. J. Combs remove a pericolic membrane but there was positively no ileal kink.)

SYMPTOMATOLOGY

The clinical symptoms described by Jackson, who does not mention the ileal kink, and those of Martin, who does not mention the pericolic membrane, are practically identical, and each is practically the same as those given

by Lardennois (12) for the condition of "ptosis of the cecum," in which he makes no mention of either the kink or the membrane.

They are those common to general enteroptosis, such as malaise, headache, backache, anorexia, nausea, eructation of gas, sometimes vomiting, pain or a sense of fullness after eating, loss of weight and of muscular tone. Constipation may be very obstinate and may be the first symptom mentioned and there may be brief periods of diarrhœa. There is frequently a sensation described as "coals of fire" and the right iliac region may become exquisitely tender, and so hypersensitive that the weight of even bed clothes becomes intolerable, which of course suggests the diagnosis of hysteria. The pain varies greatly, from merely a sense of discomfort to that which may demand morphine. The severe colics come on at irregular intervals and the pain and tenderness is usually located in the right iliac fossa and in the region of the umbilicus. There may be a swelling due to gas in cecum. There is no increase in the temperature, and the attack is terminated or greatly relieved by recumbency, diet, enemata, and lavage, one or all, hence the temporary relief following appendectomy. These attacks are repeated until there is a constant pain in the right side of the abdomen which makes a chronic invalid of the patient.

Later there develops an autointoxication, with greatly impaired nutrition, with the foul breath, the clammy extremities, the muddy, hairy skin, the cystic changes in the breast, and the neurasthenia, all so masterly described by Lane under the caption "chronic intestinal stasis," which is frequently a preliminary stage in anæmias, tuberculosis, and cancer.

Glenard, as far back as 1887, attributes the constipation in enteroptosis to kinks in the colon.

Binnie, in 1905, in describing "pericolitis dextra" very succinctly summarizes the symptomatology by saying, "Cases presenting an almost typical history of chronic appendicitis with one or more acute exacerbations."

In 1905, Corner and Sargent (13) reported cases of acute volvulus of the cecum, and mentioned that chronic cases may be more common than is supposed, the symptoms being due to an axial rotation of the cecum which imperfectly occludes the lumen of the ascending colon or of the ileum.

Wilms (14) in 1908, and Lardennois in 1910, each describe practically the same clinical syndrome under the title "ptosis of the cecum."

At the German Surgical Congress, only a couple of months ago, Wilms (15) in discussing movable cecum and chronic typhlitis stated that the attacks of pain may be occasioned by adhesions in the region of the appendix and cecum or ascending colon, so that dragging takes place when the intestine becomes full; or by kinks or torsion of the colon at the hepatic flexure or the attachment of the cecum, temporarily occluding the intestine.

The diagnosis is comparatively easy, especially after removal of the appendix has been followed by no improvement.

The attacks of pain are frequently mistaken for biliary, renal, or appendical colic, ileus, or disease of the adnexa, and the constant tenderness, often hyperæsthesia, between attacks is often mistaken for a functional nervous disorder.

A differentiation between primary or idiopathic neurasthenia or hysteria, characterized by right-sided abdominal pain and hyperæsthesia, and a neurasthenic condition, secondary to actual abdominal irritation, is most difficult and uncertain.

But with more experience and careful study, the latter class is rapidly increasing, at the expense of the former.

The bismuth meal and the X-ray examination has been found to be of practical value by both Lane and Hofmeister.

TREATMENT

Rational treatment here, as elsewhere in medicine and surgery, depends upon the etiology which, in these cases, is not yet clear.

The false membrane and the angulation of the ileum should be suspected and searched for in every case of chronic appendicitis, in which, at operation, there is a possibility that the appendix might not be the entire course of the symptoms. A satisfactory exploration will not be possible through the small button hole incision so frequently employed in such

cases, and will necessitate an incision ample to examine the terminal ileum and the ascending colon.

Laparotomy and division of the band causing the ileal kink, or the removal of the pericolic membrane, is plainly indicated. But in so doing *results and not the cause* have been remedied. And it does not seem to be sufficient treatment, notwithstanding the fact that relief from symptoms does occur in some cases, as in those reported by Jackson, Sweetser and MacLaren (16), and in the case operated upon by Gudden over two years ago.

On two different occasions, Jackson (17) has reopened the abdomen for different conditions and found that no new adhesions had formed in place of the pericolic membrane that had been removed.

Binnie says, "Removal of the appendix *plus* destruction of adhesions often leads to symptomatic recovery, but often it does not."

Lane has not met such satisfactory results and advocates extensive operations, such as ileocolostomy, or ileosigmoidostomy, or excision of the colon in cases that have resisted less radical measures. Hofmeister also performs a short circuiting operation in such cases. In an attempt to prevent the re-formation of adhesions, Mayo applies vaseline to the denuded surfaces. Martin very rationally places the patient in the Trendelenburg posture, after separating the kink, carefully locates the viscera as he thinks is best, then closes the abdomen and applies a firm plaster dressing so that the viscera are kept out of the pelvis. The patient is kept with the head low for days during the convalescence and a properly fitting straight front corset is applied before the patient is allowed to arise from bed, to be followed by a systematic course of abdominal gymnastics.

Assuming the possibility that the development of the pericolic membrane is an inefficient attempt on the part of nature to hold the cecum out of the pelvis — inefficient because it was thin, broad, and caused a marked pull on a broad surface of sensitive parietal peritoneum, and caused pain — in 1909, while removing a pericolic membrane, I left this membrane attached at its inner and lower insertion; this was twisted into a strand which I anchored to the abdominal muscles while closing the wound. (Fig. 3.)

In this manner, I hoped to hold the cecum out of the pelvis in a more efficient manner, that is, by a thick narrow cord, instead of a thin broad membrane, and attached to the muscle of the wall instead of to a broad surface of the parietal peritoneum. The appendix should be removed as a matter of routine. This procedure I have repeated eight times and there have been no bad results. The first case is now over 1½ years and there is a perfectly satisfactory outcome. In two of the early cases, there is not much improvement in the condition of the patient; this I now believe is due to the fact that an ileal kink was not looked for, and this is probably the cause of the unsatisfactory result.

Of the recent cases, one may not, of course, speak of results, as the time elapsing since the operation is not sufficient.

Wilms (14), of Basle, has reported successful results in 40 cases in which he supported the cecum in a retroperitoneal pouch made by reflecting the posterior parietal peritoneum.

CONCLUSIONS

1. Kinks in the lower ileum and membranous pericolitis are common in cases presenting symptoms of chronic appendicitis.
2. Removal of these conditions has been followed by permanent relief, in some cases in which appendectomy was not followed by improvement.
3. They should always be looked for while operating for chronic appendicitis.
4. In order to do so, a large incision will be necessary.
5. They are probably not of inflammatory origin, but due to ptosis of the cecum.
6. When present they should be removed or corrected, and an effort made to keep the cecum up and out of the pelvis.
7. It is not to be expected that this will relieve all such cases, but from a review of the literature and personal experience, it would seem rational to suppose that when liberal abdominal incisions and correction of these conditions are more common, that our remote results after operation for chronic appendicitis may be improved.

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ACTINOMYCOSIS OF THE STOMACH

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IN abdominal actinomycosis it may be difficult to determine the organ originally affected; hence, though the stomach has been obviously involved in several cases of abdominal actinomycosis the extent of the disease had usually rendered it impossible to say that the gastric affection was primary.

In the case mentioned below on which I operated in December, 1910, there was no record of the patient having chewed straw or swallowed anything that might give rise to disease, nor was there any evidence pointing to the primary involvement of any other organ than the stomach.

The following is the report of the case that came under my care:

Mrs. W., aged 60, was well up to January, 1910, when she began to suffer from pain and discomfort in the upper abdomen and to lose flesh; her appetite was poor and she is reported to have suffered from indigestion. Pain was not a prominent symptom and did not bear any very definite relation to food.

In May a tumour was discovered in the epigastrium, after which loss of flesh became more rapid.

When I saw her in November, the epigastrium was occupied by a tumour extending across the middle line on both sides, but the bulk of the swelling was in the left, extending upwards beneath the left costal arch. The skin over the tumour was thickened and edematous and the abdominal swelling appeared to be adherent to the anterior abdominal wall. On giving soda water to inflate the stomach a resonant area corresponding to the stomach appeared in front of the main part of the tumour. An examination of the blood and urine revealed nothing abnormal. The temperature had been normal throughout the illness.

December 6, 1910. A vertical incision was made a little to the right of the middle line. The abdominal wall was found to be much thickened and edematous and no distinction could be made between muscle and fascia. On dissecting carefully downwards an abscess cavity was opened containing about a teaspoonful of thick, creamy pus. This cavity was scraped out and purified and a further dissection was made and a larger cavity opened, which proved to be the stomach, there being no distinction between the tissues of the viscus and the abdominal wall. The cavity was drained until the following day, the wound being closed quite up to the tube. An examination of the pus showed the presence of mycelium of actinomycosis. The day after operation the stomach drain was removed and the patient was fed by rectum. Potassium iodide was administered in the rectal injections. Gastric juice drained through the sinus, which gradually closed and the wound healed completely. The patient left the nursing home relieved and certainly looking better, but although general treatment and the administration of iodide of potassium were carried out subsequently, and the patient was able to take food, she gradually failed and died May 6th, five months after operation.

REMARKS

In over 50 per cent of cases of abdominal actinomycosis the cecum is the first part attacked.

Grill says that of 77 abdominal cases treated surgically, 45 died, 22 recovered, and 10 were improved.

Frazier (Keen's System of Surgery) states that the mortality in abdominal actinomycosis in the United States has been 71 per cent of all cases collected.

In 1904, I reported a case of actinomycosis

of the gall-bladder, no other case having previously been recorded.

At operation the abdominal wall was not invaded, but the omentum, gall-bladder, and right border of the liver were intimately matted together and invaded by granulation tissue containing yellow particles. The cavity of the gall-bladder was scraped out and irrigated, after which a large drainage tube was inserted. The tube was shortened and removed in a week, when the wound was packed with gauze dipped in hazeline. He returned home in a month and followed out treatment by iodide of potassium. Four years later a letter was received from Dr. D., to say that the patient was quite well and had had no further trouble after his return home.

Though treatment failed in the gastric actinomycosis, the above case shows that even an extensive abdominal actinomycosis may yield to combined surgical and medical treatment.

FACTORS IN THE PRESENT DAY MORTALITY OF APPENDICITIS

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THE principal thought which has led to the writing of this paper is that at the present time, in the great majority of the fatal cases of appendicitis, the actual cause of death is a more or less remote complication. One will be especially impressed with this fact if he compares the literature of early days of operating for appendicitis with that in recent journals. In cases reported in the eighties and nineties most of the deaths came quickly and were due to the immediate intra-abdominal condition. In the last few years, a large proportion of the deaths reported occur weeks or even months later from secondary conditions.

Modern methods of operating and the wonderful improvements in after-treatment devised by Murphy have so reduced the mortality from appendicitis that we believe it is well worth while to make a special study of the exact reasons for death in the few fatal cases that we still have. Of course, in its last analysis, death is generally due to delay in operation, although this is not always true, as a few cases to be detailed later will show. In the present discussion we will lay aside entirely the question of delay in appendicitis and discuss the mortality in cases as they come to general hospitals which still fulfill to a large extent the purpose of a dumping-ground for the family practitioner who finds his case of acute appendicitis doing badly under medical treatment.

The present study is based on three hundred operative cases, among which there have been sixteen deaths from all causes. This is a mortality of five and three-tenths per cent, which I believe is a fair one for a hospital which serves the previously mentioned purpose of a dumping-ground to the immediate community. No bad case has been refused operation and this series does not include cases where the appendix has been removed for cause in the course of other operations.

Classified according to the pathological condition at the time of operation the three hundred cases may be divided as follows:

Class No. 1. "Appendix acutely inflamed or gangrenous but with no pus outside the appendix," 59 cases with 3 deaths.

Class No. 2. "Acute cases with localized abscess," 64 cases with 2 deaths.

Class No. 3. "Acute cases with free pus," 20 cases with 9 deaths.

Class No. 4. "Chronic or recurrent cases," 157 cases with 2 deaths.

To explain the above classification, I may say that the first class includes all the acute inflammatory cases operated on during the stage of acute symptoms and includes those where the appendix has been completely gangrenous and where there have been many dense acute inflammatory adhesions. These

cases are often the most difficult to operate on and in them a fatal result is often to be more dreaded than in cases where there is an old localized abscess which has passed the very infectious period.

Class two includes the ordinary cases where there has been a walled-off abscess.

Class three includes all cases where free pus has been found immediately on opening the peritoneum, and this is fairly comparable to the general peritonitis, spreading peritonitis, etc., of other writers, although of course with the present operation no attempt is made to determine the exact extent of this free pus.

Class four includes the ordinary chronic grumbling appendicitis and all cases in which an interval operation has been done between the acute attacks.

Coming now to the question of the various causes of death we are impressed with the fact that under present methods a large number of our fatal cases of appendicitis really die of something else, that is, a more or less remote complication. In order to demonstrate this it will be necessary to give in some detail the history of the fatal cases and then discuss them in relation to the ultimate cause of death rather than in relation to the original pathological condition.

Summary of fatal cases:

GROUP 1. Recovery from operation and death later from pulmonary embolism. Two cases.

CASE 1. W. B. H., male, 36. Operation on fourth day of attack. Appendix completely gangrenous. Large mass of omentum adherent. No pus outside appendix. Drainage on account of inflamed omentum and adhesions. Patient did well until nine days after operation when he developed a temperature of 102 degrees, pulse 110, numerous rales in right chest but no signs of consolidation or fluid. This condition entirely subsided and in the meantime the wound had healed. Patient then did well in every way and on the twenty-fifth day after operation was allowed to sit up in bed. The following day complained of pain in right leg but there were no physical signs of phlebitis. Afternoon of same day suddenly cried out with pain in chest, breathing became very labored, and patient died ten minutes after onset of pain in chest. Autopsy showed thrombi in pulmonary arteries.

CASE 2. F. E., male, 21. Operation on fourth day of attack. The appendix behind cecum surrounded with dense mass of adhesions but no pus outside appendix. Wound drained. Patient made uneventful recovery and was doing well in every way. On eleventh day after operation had been chatting with his brother and, when the brother got up to leave, patient said he felt well enough to go with him. About fifteen minutes later cried out with pain in chest and died in ten minutes of pulmonary embolism. No autopsy.

GROUP 2. Death due to accidents and previous diseases. Two cases.

CASE 3. T. H., male, 45. Attack began twelve days before operation but patient was not confined to house. Large amount of free foul pus. Drainage through abdominal wound and through loin. Patient made uneventful recovery from operation but was troubled with severe cough. Examination before operation showed marked chronic bronchitis and emphysema, the so-called miners' asthma of the coal fields. On the tenth day after operation during a spasm of unusually severe coughing patient burst open wound and forced three feet of intestine out into the dressings. Ether necessary for reduction and patient continued to sink and died in twenty-four hours with general peritonitis.

CASE 4. J. E. A., male, 51. Operation on fifth day of attack. Ruptured gangrenous appendix with general peritonitis. Treatment by Murphy method. Patient did well after operation and by fifth day all abdominal symptoms had subsided. Several days after operation patient developed diabetic coma and died nine days after operation from this cause. Patient had had diabetes for several years before operation and had five per cent of sugar at time of operation.

GROUP 3. Cases making good recovery from operation and dying afterwards from pulmonary infections. Three cases.

CASE 5. J. R., male, 16. Operation on fourth day of attack. Gangrenous appendix with general peritonitis. After-treatment by Murphy plan. Patient did well and all abdominal symptoms subsided. On eleventh day after operation patient developed difficulty in breathing with cough and foul expectoration and died on thirteenth day after operation from purulent bronchitis.

CASE 6. W. A., male, 12. Operation on third day of attack. Gangrenous appendix with general peritonitis. After-treatment by Murphy plan. Patient did well, abdominal symptoms entirely subsided after the end of one week. Tenth day patient developed temperature, dyspnœa, and cough with foul expectoration and signs of consolidation over right base. Died sixteen days after operation of right-sided pneumonia.

CASE 7. A. A. S., male, 35. Interval operation. Small atrophic appendix. Patient took ether badly and developed a large amount of mucus in throat. On second day after operation patient began running high temperature with severe cough and foul expectoration. Lung condition continued to grow worse and patient gradually developed picture of

last stages of tuberculosis, although repeated examinations of sputum were negative. Patient had been a miner for some time but had had no special "miners' asthma." Patient died of lung condition sixty-nine days after operation. Patient's brother had died of tuberculosis and mother had died of a lung trouble, nature unknown.

GROUP 4. Cases making a good operative recovery but dying some time later on account of exhaustion due to fecal fistula. Three cases.

CASE 8. B. P., female, 14. Operation on fourth day of attack. Appendix perforated and large localized abscess in pelvis. After-treatment by Murphy plan. Patient did well until about two weeks after operation at which time a fecal fistula developed. After this patient gradually weakened and died one month after operation, apparently from exhaustion due to fecal fistula.

CASE 9. J. H., female, 18. Operation on sixth day of attack. Very dense fleshy adhesions around appendix and cecum, and cecum was torn in freeing appendix. Suture of wound of cecum very difficult on account of thick boardy inflammation. Fecal fistula developed. Patient was discharged after three months with slight fecal discharge still present but general condition good. Returned to hospital two months later and operated on for subphrenic abscess. Was discharged in fair condition. Again returned to hospital fourteen months after previous operation very much emaciated from fecal fistula and died in a short time without further operation.

CASE 10. G. H., male, 46. Operation thirty-six hours after beginning of first attack. General peritonitis. Appendix perforated and intestinal contents oozing into general peritoneal cavity. Olive oil enema on table followed by Murphy plan of treatment. Patient did well after operation and abdominal symptoms had subsided on third day. On seventh day patient developed another abdominal abscess which burst through drainage wound, discharged later, and became fecal. Patient died on nineteenth day of exhaustion.

GROUP 5. Cases dying with immediately continuing symptoms of abdominal sepsis. Six cases.

CASE 11. E. W., male, 8. Operation on fifth day of attack. Appendix ruptured. Extensive abscesses in right and left lumbar regions and in pelvis. Continued to do badly and died five days after operation.

CASE 12. F. S., male, 22. Operation on fourth day. Appendix gangrenous and perforated. General peritonitis. After-treatment by old methods. Patient continued to do badly and died two days after operation.

CASE 13. S. P., male, 2. Operation on sixth day of attack. Gangrenous appendix. General peritonitis. After-treatment by Murphy plan. Continued to do badly and died eight hours after operation.

CASE 14. M. H., male, 14. Operation on fourth day of attack. Ruptured appendix. General peritonitis. After-treatment by Murphy plan. Continued to do badly and died three days after operation.

CASE 15. F. F., male, 18. Operation on fourth day of attack. Ruptured appendix. General peritonitis. Case occurred before publication of Murphy plan and was treated by old methods of stimulation. Continued to do badly and died forty-eight hours after operation.

CASE 16. Mrs. S., female, 34. Interval operation. Pursestring closure of stump. Ventral fixation done at same time. Patient continued to do badly and died six days after operation. Death due either to fixation or to leakage of the pursestring suture, probably the latter.

From the reports of these cases it will be seen that only six out of the sixteen, or two per cent of the total number, died from immediate effects of the disease, the remaining ten died of more or less remote conditions. It is the secondary causes of death which I believe are important to study in order to see if there are any means by which these complications can be avoided.

The first group of fatal cases (cases 1 and 2) due to pulmonary embolism are especially interesting. This accident is perhaps more common than is generally supposed. A personal friend of the writer died of this condition after an operation in Paris the first day or two after he had been sitting up. Kelly reports three cases among eighty-six autopsies following appendix operations. Peck (1906) reports a fatal case of embolism occurring on the tenth day in a young woman who had been making an uninterrupted recovery after an interval operation for appendicitis. Peck believed the embolism in his case to be in the brain. Wharton (1896) also reports a case of cerebral embolism in a boy eight years old. The embolism occurred on the third day after operation and the paralysis was only partial and was followed by complete recovery. Another writer has recorded a case of embolism of the right tibial artery causing gangrene a short time after an appendix operation. Stimson (1907) mentions a case of appendicitis with general peritonitis dying fifteen minutes after operation with symptoms he considered due to pulmonary embolism. This is the only case the writer has read of where pulmonary embolism

has been considered to be the cause of death within the first ten days after operation.

The question of embolism is intimately connected with that of thrombosis of the pelvic and lower abdominal veins, and it is probable that all these cases of embolism were secondary to local thrombosis, although most cases come on with absolutely no warning ten or twenty days after operation in a patient who has apparently been doing perfectly well, and the majority come on in clean cases. In this connection it is interesting to note that, while it has never been fatal, phlebitis in the femoral veins has occurred a number of times. Willy Meyer (1901) first called attention of American surgeons to this subject. At this time he reported two cases of femoral phlebitis each involving both the right and left sides and each occurring in cases where there was no pus but where there were many dense adhesions around the appendix. At the same time Meyer quoted Lennander who reported five cases in the Centralblatt für Chirurgie. In three of Lennander's cases both sides were involved. At the meeting in New York at which Meyer brought out this subject, A. B. Johnson stated that he had seen several cases all of which were in women and all of which were on the left side only. J. B. Walker reported a case in a man involving the left side only, and B. F. Curtis reported two cases in men involving the left side only. Brittin (1903) reported a case of femoral phlebitis in a man involving the left side only. Barclay (1908) reported a case involving the right side in a man with appendicitis with abscess. All of these cases recovered without further trouble. Another very interesting case connected with local vascular disturbance was reported by Dowd in 1909. Dowd's case was that of a boy who immediately after an operation for appendicitis developed an ascites which was permanently cured by the Talma operation. Nearly all of these cases of vascular disturbance have been reported in cases in which there was no pus at the time of operation and in which the wound healed by primary union. The operation is not the sole factor in producing these vascular troubles, as is shown by a case reported by Buhlig (1908). The patient was a man twenty-six years old who had a mild attack of appendicitis. There was no operation but a phlebitis in the left leg developed a few days after the recovery from the abdominal symptoms. Another very interesting group of cases belonging in this category are those rather rare ones in which vomiting of blood or intestinal hæmorrhages follow operations. The writers who have paid special attention to this subject consider that these hæmorrhages are due to emboli in the gastric or intestinal vessels. These cases, of course, do not include those where there has been bleeding due to an imperfect inversion of the appendix stump. The majority of writers consider that thrombosis and phlebitis are due in some way to infection, either from bacteria introduced into the tissues at the time of operation or from auto-infection from the alimentary canal. It is rather difficult to explain how it is that in the fairly numerous cases of local thrombosis or phlebitis embolism does not occur and conversely in the cases of fatal embolism that there are no previous signs of any local disturbance.

The second group of fatal cases, including the death due to evisceration during a fit of coughing and that due to the previous diabetes do not call for discussion, except to note that the case with diabetes died of that condition several days after his abdominal symptoms had subsided.

The third group, that of the cases dying later from pulmonary infections, is an important one. In cases five and six the patients had been saved from the condition immediately threatening them by the Murphy plan of treatment but died later of infectious processes in the right lung. Inflammatory conditions in the right chest are fairly frequently reported after appendicitis. They nearly always occur after pus cases, especially when there has been general peritonitis. Owing to the fact that the right side of the chest is involved more frequently or more severely we must infer that the products of infection pass more or less directly to the right side either by lymphatics or by burrowing behind the liver and through the diaphragm. It may be too that in these cases there is a liver abscess or a subdia-

phragmatic abscess, although there were no signs of it in our own patients. It is especially distressing in these cases to see patients after they have undergone the ordeal of an operation and the uncomfortable or even harrowing Murphy treatment die later from an inflammatory condition of the chest. The Fowler position itself probably reduces this accident to an extent but beyond this there is little that can be done in the way of prevention except perhaps in regard to the anæsthetic. Owing to the probability already mentioned that this infection is a more or less direct extension from the original inflammation the anæsthetic itself can not be considered to be entirely at fault. However, it is not to be doubted that the administration of ether even for the short periods necessary must impair the resisting power of the lung and it is probable that with gas and oxygen anæsthesia the number of these cases would be slightly reduced. Case seven, in which a similar condition followed an interval operation, was undoubtedly due entirely to the ether itself and is one of the many cases which should properly be classed as a death from ether, although it occurred two months after the operation. J. B. Roberts at the last meeting of the American Surgical Association brought out a new point that may be of considerable importance in connection with the right-sided inflammations in the chest following appendicitis operations. Roberts considers that one of the early symptoms of appendicitis is a congestion at the base of the right lung caused by spasm of the diaphragm and other respiratory muscles on the right side. If it is a fact that this congestion is already present at the time of operation in a large number of appendicitis cases, we have another explanation of the inflammations that follow, and also another reason for searching for a safe anæsthetic which is less irritating to the lungs than ether.

Group 5. These cases, where death has been due to exhaustion following a fecal fistula, are seen much more rarely now than formerly. Deaver, in his edition of 1896, states that a fecal fistula is the most common postoperative complication. I think no one would make this statement at the present time. The diminution of the number of these cases is partly because more operations are being done early and also partly because drainage by glass or rubber tubes is being employed less frequently. For some unexplained reason it seems to be a fact, as illustrated in case eight, that this complication is more serious when it develops late than when it develops immediately after the operation, especially if this accident be foreseen at the time of operation and provided for by proper drainage. An immediate fecal discharge is not usually of very great importance. Indeed Stimson (1907) states that in cases where the appendix has already sloughed off it is better not to attempt to find and close the stump. Nearly all the fecal fistulas which come on immediately heal about as quickly as an ordinary abscess case. Of course, the death in case nine would probably have been avoided if the cecum had not been torn or, having been torn, if it had been possible to suture it perfectly.

The after course in case ten is of considerable interest. This is the only one in the series treated by the rapid operation with a single drain down to the stump of the appendix that has been followed by a reaccumulation of pus in the abdomen. There are still a number of surgeons who have not adopted the plan of "stab and sit up" as it has been tersely put by Crile, and various plans of attempting to remove pus by irrigation, suction, etc., are still being followed. It must be admitted that Murphy's plan of "getting in quickly and getting out quicker," that is, simply removing the appendix placing one drain down to its stump and allowing the peritoneum to take care of itself, may at times result in reaccumulations of pus inside the abdomen. Granting this possibility, however, we still believe that in a long series of cases the mortality will be lower when the peritoneum is interfered with as little as possible.

Of the remaining group (group five), cases ten to fourteen represent deaths due to the appendix itself and are chiefly referable to delayed operation. Three of the five in this group occurred before the introduction of the Murphy plan of treatment and probably some or all of these could have been saved by

this wonderful method. Case sixteen was one of those unfortunate ones in which the surgeon can find no excuse for the unfortunate result, although the actual cause of death may not have been due to the subject immediately under discussion. This last group of cases, of course, represents the mortality in the worst type that comes to general hospitals. It is not the intention at the present to say anything of the necessity for early operation nor to discuss the best technical methods of treatment as these are amply described in recent journals and are not the subject of essential difference of opinion now. From a purely scientific point of view there are a number of very interesting questions which may contribute to the mortality in these cases which are attended with more or less marked sepsis and which die without much, if any, improvement after operation. For instance, Brewer (1902) reports a case belonging to this group where the actual cause of death was one of the vague forms of poisoning marked acetonuria. Brewer considers that in a number of these cases some poisoning of this sort is a factor. This or similar conditions might be recognized more often if the clinical laboratory devoted the same amount of attention to cases after an operation that it frequently does before an operation.

The harm that ether does in connection with lung infections has already been mentioned. It is probable also that in many cases of general peritonitis and the septic types of localized abscesses the ether also very much diminishes the patient's chances of recovery. It has long been known that ether very markedly reduces the individual's power of protection against bacteria, and it must frequently be the case that this added handicap is just sufficient to cause a fatal issue which might not have taken place if the power of resistance had not been reduced. A most suggestive article on this subject has recently been published by Graham (Journal of Infectious Diseases, March, 1911). Graham shows that ether very markedly reduces the phagocytic power of leucocytes even if no operation is done. He has shown also that this reduction in phagocytic power can be prevented simply by the administration of 150 cc. of olive oil by rectum. Graham's article is one of the most suggestive that has appeared in some time and it should receive the careful consideration of every operator. If his experiments are supported by clinical evidence we have been given a most valuable additional resource in every case of operation for septic conditions.

Another interesting idea is that in many of these bad cases cultures of the blood before operation will show a true bacteriemia. If blood cultures are positive before operation the prognosis is extremely grave, not so much because the bacteria in the blood will do harm themselves as because they indicate a grave general septicemia.

Of course there are a number of other secondary causes of death which have not been encountered in the present series. The most frequent and important of these are secondary inflammatory conditions in the upper right quadrant of the abdomen. These conditions are abscess of the liver, suppurative pylophlebitis, and subphrenic abscess. There are numerous reports of all these conditions, Elsberg having been able to collect seventy-three cases of subphrenic abscess alone as early as 1901. Among these seventy-three cases there were twenty-nine deaths. Munro in 1905 was able to report thirty-nine personal cases of abscess of the liver. Nearly all of these inflammatory conditions in the upper right quadrant follow cases of abscess or general peritonitis and in the majority of cases the symptoms of the secondary condition come on after ten days or two weeks and they may be delayed for months. There are too a number of cases of rare fatal complications scattered through the literature. For instance, Fowler in 1894 reports a death due to tetanus. Mann in 1901 reports a purulent pericarditis following an unoperated case in a child of twelve. Two cases have been reported of death due to acute yellow atrophy (Barclay and Holmes). Holmes' case was proved by autopsy. Both of these were clean cases and were doing well until the time of the onset of yellow atrophy. Chloroform was used in both cases and this was very probably more responsible for the deaths than anything connected with the appendix.

PHYSIOLOGICAL PRINCIPLES IN THE TREATMENT OF ACUTE PERITONITIS

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A GENERAL discussion of so threadbare a subject possibly may be justified by a co-ordinated presentation of the causes and effects of the fundamental sequential phenomena with special reference to a more exact appreciation of rational therapy.

This communication is based upon immediate personal experience, experimental and clinical, including relevant laboratory and postmortem observations. Hypotheses have been excluded, and statements are based upon facts believed to have been established by adequate control observations.

An overenthusiastic statement of the value of experimental work is impossible since thus alone may be discovered with comparative accuracy the *why*, as well as the *because*, of the results of treatment. Two elementary studies stimulated by Dr. Halsted[1] and Dr. Ochsner[2] respectively, in which may be found authority for statements not otherwise substantiated, permitted a recognition of principles in abnormal intraperitoneal physiology of definite and profitable clinical application. Although these principles had been established approximately by clinical observation a more precise recognition of details in the processes created in the dog's belly made possible a more logical inference as to like processes occurring under similar conditions in the human abdomen.

As the parallelism became increasingly evident the residual empiricism disappeared giving place to a confidence in rational treatment that has led to a material diminution in discomfort, disability, and death.

Due acknowledgment must be made of the benefits attained through the work and experience of others, particularly that received while assistant to Dr. A. J. Ochsner in whose service was gained a direct experience with over a thousand cases of acute intra-abdominal conditions presenting many varieties. His philosophy of treatment perhaps quite as generally misunderstood by the inaccurately informed as it is widely heralded, is rational and susceptible of but slight amplification and less modification upon the basis of evidence at hand. It has been successfully utilized by all of the many practitioners who have applied the method in *every* detail. On the other hand those who have neglected any of these precautions have been proportionately unsuccessful and correspondingly hypercritical of a method they have failed to apply.

In general the etiology of acute inflammatory processes may be regarded as approximately the same for all tissues in the body. The differences in consequences, if the variations in virulence or intensity and quantity of the irritant be eliminated, depend upon the resistance and location of the tissues primarily affected, the ease of extension therefrom, the nature of the functional disturbance of the structures secondarily involved by this extension, and the resultant distress to the entire organism. Effective local resistance, inseparable to some extent from general resistance, may be regarded as the capability of the affected tissues to overcome the intoxication *in situ* which means perforce limitation of extension of the inflammatory irritant with consequent inhibition of toxin absorption. Additionally important, in the maintenance of conditions favorable to the host, is the concomitant reduction in virulence or even the extermination of the invading micro-organisms. There follows logically the cardinal principles in the treatment of all infections; the safeguarding of general resistance by aiding the localization of the inflammatory reaction and by abetting the earliest *safe* elimination of the irritant with the least possible permanent functional impairment. Intelligent application in peritonitis of these therapeutic principles gives probably more satisfactory results as regards

[1] Yates, J. L., An Experimental Study of the Local Effects of Peritoneal Drainage. Surg., Gyn. and Obstet., 1905, i, p. 473.

[2] Yates, J. L., An Experimental Study of Intraperitoneal Diffusion with Reference to Toxin Absorption. Ibid., 1908, vii, p. 405.

the protection of life and subsequent well being than in any other form of acute inflammation.

Peritonitis is here regarded as at least a microscopically demonstrable exudative reaction of the serosa, i. e., more than simple hyperæmia; it may be localized (even without adhesions), diffuse (even with adhesions) or in extremely rare instances, general.[1]

It results from (a) chemical, (b) physical, (c) combined chemical and physical irritation of the serosa, e.g.: (a) ruptured aseptic urinary bladder; infections; (b) foreign bodies, including any form of drainage; (c) ruptured sterile dermoid cyst; foreign bodies in the presence of infection. Granted that an individual has sufficient stamina to react to any of these irritants, the primary reaction, except in degree, is locally the same, however or wherever that irritant be introduced. If this reactability is gone all treatment is futile save a modified euthanasia.[2]

Locally the reaction is an almost immediate hyperæmia leading promptly to a copious serous exudation with some endothelial desquamation and a little later (probably less than four hours) to a substantial deposit of fibrin with its benevolent tendency to form adhesions. Exceptionally in the presence of suppuration this fibrinous deposit is prevented or removed.

The early outpouring of serum, which almost might be termed a gush, overflows from the area of the peritoneum primarily involved carrying with it some of the irritant, diluted to be sure, but usually still capable of producing further irritation though this capability becomes progressively less as the distance from the primary focus increases. The spreading or diffusion of this more or less irritating serum is mainly influenced, aside from uncontrollable capillarity and *vis a tergo* by the following three factors: position of the body (gravity), active and passive movements affecting the abdomen, and peristalsis, but the greatest of these is peristalsis. The paths of least resistance are not often readily determinable but in general the lines of wider extension from the lower to the upper portions of the abdominal cavity are along the flanks and (in dogs at least) over the gastro-hepatic omentum. Should this diffusion continue after cellular elements have appeared in the region of most intense reaction, the serum instead of being clear becomes bloody, milky, or even purulent in appearance, and yet may not signify a general or even diffuse peritonitis. Indeed, at this stage the excess of exudate may have become comparatively if not quite non-irritating to the serosa it reaches. In other words, the mere presence of a diffused purulent exudate upon remote peritoneum is no more a proof of an underlying peritonitis than it is a positive indication that such a lesion will there develop, *unless conditions favoring this development are permitted to obtain*. Dogs recovering from experimental peritonitis may have excess of cloudy peritoneal fluid after three days when apparently well. This fluid has become clear by the sixth day but even then may contain micro-organisms. These facts explain certain clinical observations that may be interpreted erroneously. For example, the general, and even more often the

[1] Acute general peritonitis where virtually the entire peritoneum is involved has been so rare (one case) as to lead to the assumption that an individual suffering from a peritoneal infection sufficiently virulent to become general in the acute stage seldom survives to this point. The case in question combined little resistance (anæmia) with comparatively avirulent coccal infection. In this connection it should be recalled that Wegner has shown the area of peritoneum to be about ninety-eight per cent of the skin surface, and in dogs to be capable of absorbing three per cent to eight per cent of the body weight in an hour and to exude serum with equally marvelous rapidity.

[2] Irritated peritoneum produces through the resulting tenderness and protective rigidity of overlying muscle, evidence that has been accepted as indicative of peritonitis. If the inflammation is to develop, there has been a preceding stage of irritation, but this, however, can undergo prompt and complete resolution by neutralization, elimination, or encapsulation of the irritant. Individuals who have lost their reactability and who are operated upon show at necropsy little if any tendency to heal. If drained, the drain remains more or less free in the peritoneal cavity for obvious reasons. Observations upon such cases have led to the erroneous notion that it is possible to drain the general peritoneal cavity, which Mikulicz showed to be physically impossible even in the cadaver.

homolateral abdominal rigidity[3] and tenderness such as is not infrequently seen in acute non-perforative appendicitis, does not necessarily signify general or diffuse peritonitis, but does indicate, positively, diffuse irritation and often that alone, as the excess of clear serum disclosed by many an ill-advised counter incision has upheld in man these same observations made upon animals. Similarly the presence of free turbid or purulent intraperitoneal fluid is not of itself indication of a diffuse or spreading peritonitis which is determined only by the reaction of the peritoneum. The morbid potentiality of an exudate is measurable, not in terms of its physical appearance, but in proportion to its capability chemically to irritate or injure tissue as manifested by the character of that tissue reaction.

Any clinical classification of cases based solely upon the character and distribution of the peritoneal fluid exudate is to some extent erroneous, and though general peritonitis as above defined may be suspected *intra vitam*, necropsy demonstration is the only proof of its existence.

These local and general physiological reactions to irritation must be recognized in proper sequence if therapy is to be instituted rationally and not merely as a routine but varied to meet individual conditions. It should be more generally understood that while some primary capillary and gravity diffusion is inevitable, the degree and rapidity of the more serious toxin absorption varies directly with the extent of that still wider and somewhat later diffusion which is decidedly controllable. The greatest danger lies in the degree and rapidity of the first absorption, since early in the local reaction the battle may be won by not permitting the individual to be crippled by a sudden overwhelming dose of toxin before the complex defensive mechanism can exert itself. Subsequent absorption has been demonstrated experimentally to be less rapid and is still more subject to therapeutic limitation through a proportionately far greater restriction in diffusion. In addition the tolerance of the peritoneum to infection develops rapidly. Individuals should be aided in the development of their own immunization as experience has demonstrated to be the least injurious in animals, i. e., by initially small dosage of toxins.

Moreover, the fibrin usually present early on the surface of those structures contiguous to the site of greatest irritation always tends to form adhesions thus leading to an encapsulation[4] of the irritant with a consequent rapid cessation of serous exudation and hence also of diffusion.

An early diagnosis of peritoneal irritation is usually simple, the recognition of the exact source of the irritant is at times impossible but its location in one of the abdominal quadrants is generally certain and this is the main question to be answered in the best interests of the patient. After such a diagnosis has been indicated by the history, treatment should begin with the physical examination, and as no detail is unimportant in a serious

[3] Frequently it is possible to predict the position of the appendix by this tenderness which is apt to be homolateral when the appendix is lateral to the cecum and bilateral when in the pelvis or lying across the median line. This is also of importance as indicating the lines of diffusion and is strong evidence in support of keeping the affected side at a lower level.

[4] The encapsulation of a foreign body is complete in dogs in less than six hours and in man probably in about the same period unless reactability has been lost, under which conditions scarcely an adhesion may form before death. This walling-off process can not be prevented in healthy individuals if a physical irritant (drain) is present though active peristalsis will retard the completion a little. The encapsulation of chemical irritant (abscess) is similarly but possibly somewhat less promptly accomplished and is probably even more facilitated by intestinal quiet. One has but to recall ordinary operative experiences to gain confirmation of these statements. After any operation requiring the packing off with gauze there is constantly evident an increase in the peritoneal fluid; serous exudate from mechanical irritation. If the procedure has been prolonged the gauze is already adherent to parts of the peritoneum, especially omentum; beginning encapsulation. In making manual intraperitoneal examination at some distance from an incision, how difficult is it at times satisfactorily to dislodge intestines in order to palpate distinctly. When the abdomen is closed the sero-serous approximation is even more intimate, and if sticky with fibrin, adhesions are inevitable and the less the movement the sooner they are formed.

infection, all should be considered as serious and so treated until the patient is well. Inspection is frequently as valuable as palpation, percussion is often of no use at all, and auscultation, at times of extreme value, is usually neglected entirely. "Nothing but the patient's dislike ever was gained by forceful or needlessly repeated palpation"; moreover it promotes diffusion, the pain provoked helps to destroy that most valuable asset, the individual's morale, and is a real factor in causing and intensifying shock.[5]

Having established a diagnosis of irritation if not of inflammation of the peritoneum, and determined the location of the primary focus, or when possible, also the etiology, the first effort should be to limit diffusion which also means promoting localization and encapsulation, and to protect the patient's general condition by the elimination, as far as possible, of every source of local and general irritation. There can be no discussion as to the positive advantages of early operations in acute intra-abdominal affections, particularly those occurring in typhoidal, gastric, or duodenal ulcer, perforative peritonitis, and in acute intestinal obstruction. Whether the desirable prompt intervention is or is not possible should in no way affect the general plan of treatment, since the main problem is the protection of resistance chiefly by the limitation of diffusion, which means restricted absorption.

There was a time when fate vested the ability to recognize early peritonitis only in surgeons and in a very few of them, but now every practitioner should be able to make the diagnosis. This digression is simply to lend emphasis to the presentation of the following heresy upon which depends the saving of some of those unfortunates who are still too well represented in mortality statistics and who should not complacently be accepted as inevitably doomed.

As a heritage of that rather recent period when the factors in early diagnosis were being established by progressive surgery, we have the dictum, "Don't give opium, it masks the symptoms." The diagnosis having been made, is it not fair to ask just what good are symptoms to a patient after they have given the alarm and signaled where the fire is located? It is quite as logical to propose to do nothing if a house were aflame until the engines arrived. Begin immediately, systematically to combat the fire and to put the valuables out of harm's way in case it spreads.

The hows, whys, and becauses are simple in the extreme. *How?* General bodily and gastro-intestinal quiet, ease, warmth, and cheerfulness are the prime requisites to be attained by a comfortable position in bed in a quiet room, the administration primarily of a *full* dose of morphine hypodermically for its prompt effect, hot or cold moist abdominal applications as may be the more grateful, hot water bags to the extremities, gastric lavage and cleansing enema if indicated and keeping the individual on the aggressive. *Why?* Bodily quiet means quiet abdominal parietes, reduces the rate and depth of respiration, all important factors in retarding diffusion; it also lessens the work of the heart which is so often the weak link in the chain to life.[6]

Position in bed and of the bed are easily adjusted. Flex the thighs on the abdomen and support them with pillows, with the flank of the affected side depressed to retard diffusion toward the opposite side.

So much has been written in favor of the great value of the head high position in peritonitis that the other side deserves a hearing. Imagine a gonorrhœal conjunctivitis limited to the nasal half of one eye. Would it be considered sane to maintain that individual's head on the side of the unaffected eye

[5] The early diagnosis of acute inflammatory intra-abdominal lesions is but the recognition of a resultant localized peritoneal reaction in the majority of cases, as the symptoms are usually not otherwise directly attributable to the causal lesion.

[6] A considerable degree of the discomfort consequent upon passing a stomach tube may be eliminated by spraying the pharynx with a little four per cent cocaine five minutes previously. The real dangers of high voluminous enemata need no comment but the necessity of overseeing the administration warrants particular emphasis as the majority of nurses have little conception of the damage that can be done by even a small enema when forcefully injected.

to try to prevent extension to the as yet uninvolved side of the affected eye? Quite as reasonable is it to place an upper abdominal peritonitis in a head high position as to elevate the foot of the bed with peritonitis in the pelvis. Locally the indications are to take the position that will oppose gravity to the widest and therefore the most dangerous diffusion even in the face of the fact that peritoneal absorption apparently is most rapid from the diaphragm. When in doubt, if the individual is kept level and turned more or less toward the affected side probably the best has been done. Elevating the head of the bed, or the semisitting positions do admirably when the heart is working well (generally the cases that are certain to recover anyway) but when the myocardium shows signs of wear it is more profitable to the individual to be flat or even with the foot of the bed elevated and have a chance to live (through the maintenance of a viable blood pressure) in spite of a little extraperitoneal involvement than to be certain to die in the classical positions so beautifully pictured in many text-books.[7]

The so-called Fowler position in any of its various forms is frequently indicated but only during the period of early diffusion, a matter of a few hours, after which it is only of advantage in testing the staying qualities of the heart. Tachycardia is always an indication for at least a reduction in the degree of the head high position, and when extreme even warrants elevation of the foot of the bed.

Moist applications to the abdomen must be tempered to suit the individual, heat aids underlying and desirable hyperemia, cold retards absorption, either of which is an advantage but less so than the resulting reduction, in discomfort, especially that caused by useless palpation which this barrier generally prevents. External heat to the extremities to protect the heart through the thermal centers also tends to decrease distress. Since gastro-intestinal activity, peristalsis, is the main and the most controllable factor in promoting diffusion, its prompt suppression is demanded and easily attained. If an acute appendicitis, without vomiting, develops soon after eating, or if a cathartic has been taken recently, or if protracted retching is present, gastric lavage eliminates these immediate dangers with a certainty that justifies the distress it causes, but comparatively seldom is it necessary. Contrarily the wildest devotee to the stomach tube would never consider its use when a perforating gastric or duodenal ulcer could be suspected, not until the perforation had been sutured. The lower bowel must be emptied by the use of *small, low,* non-irritating enemata not only to restrict peristalsis but also as this organ is to become the chief source of fluid to the body until danger is passed. Important as are all of these measures, they are combined less essential to success than the rational administration of opium, which means enough to get definite physiological results.[8]

An experience in treating a considerable series of these cases has given the conviction that opium thus can be used without even predisposing to tympanites, which indeed is

[7] As drainage of the general peritoneal cavity is under any acute condition both physically and physiologically impossible, the use of any position as an aid thereto is indefensible.

[8] The physiological results to be desired are elimination of pain and inhibition of peristalsis as determined by auscultation but without undue depression of the respirations (as a rule not below fourteen to the minute). In one case of a streptococcus puerperal infection with extension to the peritoneum opium was given (twenty minims deodorized tincture in two ounces of starch water per rectum) at four- to six-hour intervals, but failed to control peristalsis (although the gastro-intestinal canal was empty) which was visible through the abdominal walls. Recovery was complete but unduly prolonged largely because the dosage was too small. Subsequently in a case of peritonitis consequent upon an undetermined abortion infection, opium was similarly given with signal success but in doses and at intervals depending upon peristalsis as determined by auscultation. After recovery was assured and the opium was withheld for a longer interval, audible peristalsis reappeared (in spite of empty intestines) and there followed a rise in temperature and pulse rate as well as a recurrence of subjective symptoms, which were again promptly dispelled by more opium. This observation was repeated with the same results, then the administration upon the lines indicated led to a rapid convalescence. In the first of these cases pelvic resolution eventually was complete, in the second, the tubes previously had been removed and no examination after recovery was permitted.

more often the result of withholding it or giving it inadequately, or still more frequently because absolute starvation has not rigidly been enforced.

Apparently local and general intoxication are not the sole factors in causing tympanites, nor is intestinal stasis, although this is a constant result when the distension is extensive. Nor can it be blamed upon decomposing intestinal contents. In complete obstruction of the more distal intestine in man (clinical observations; one case intussusception in ileum, one case carcinomatous obstruction of rectum) or animals (unpublished experiments reported by Dr. V. H. Bassett) if the bowel is empty and neither food nor cathartic be given by mouth no distension arises, indeed under such circumstances if water be given per rectum life will be limited by starvation and not by the ileus, although at any time the classical evidences of obstruction may promptly be developed by feeding a little milk or giving a purge. These observations would seem to indicate that peristalsis is of very significant etiological consequence in the production of tympanites.[9]

Experimental and clinical evidence proves that irritants (including bacterial toxins) introduced intraperitoneally stimulate active and prolonged peristalsis even when the bowel is empty, and this is controlled as far as is known only by opium and better by the full drug than by its derivatives. As far as local effects are concerned opium is only contraindicated in inadequate doses. Its general effects are entirely beneficent. By inducing tranquillity through the elimination of bodily distress it is of the utmost value in protecting the patient from shock and the loss of morale. Indirectly it is of both local and general advantage by inducing quiet, diminishing respiration, and keeping the rectum in condition to retain with little or no discomfort the water given as a continuous enema.

Incidental to keeping a person on starvation treatment for more than a few hours there arises a need of profitable occupation. This is best supplied by chewing gum and the use of a mild mouth wash at frequent intervals, as thus the mouth may be kept moist and sweet, an almost certain prevention of parotitis which may determine a fatal issue especially in protracted cases and in children. Sucking ice chips is also grateful and the little water swallowed does no harm if the bulk is spat out when the ice is melted.

Aside from opium drugs are of little value. A little digitalis may help, though in tachycardia an ice cap over the precordium is probably as good and is certainly less harmful. Sugar, preferably milk sugar, added to the continuous enema may add a little fuel though it does not always diminish and seldom removes the acetone which appears in the urine of these starved individuals.

Operative intervention so frequently regarded as *the* treatment in peritonitis is really an incident, albeit a most important one, in the therapy. An incident to be introduced early when possible, otherwise to find its positive indication in the patient's general and local condition irrespective of any fixed rule. Great as is the diversity of opinion as

[9] Treatment of tympanites to be rational must be physiological. Whether or not it be accepted that extreme distension results mainly from fatigue of the intestinal muscularis it is certain that some hyperperistalsis precedes tympanites consequent upon any intraperitoneal lesion, obstructive or inflammatory. Consequently the control of peristalsis, probably by conserving muscular tonicity, must be regarded as preventitive of extreme distension. Once established the end result, paralysis of the intestinal muscles, is the same whether the cause is muscular fatigue or intoxication or both. Therefore most certain relief will follow a mechanical reduction of the distension in order to foster any residual energy there may remain in the muscularis thus to insure subsequent contractability. Attempting by cathartics to overstimulate asthenic muscle is courting disaster and that in face of the established fact that under such conditions rest is the prime requisite. It would be quite as logical to try to shake a response out of an individual unconscious from cerebral concussion.

Frequent hot enemata given low and siphoned off if not expelled, large abdominal stupes with repeated gastric lavage offer the best chance for relief. Enterostomy may become indicated and should be done under local or combined local and gas anæsthesia. Permanent tubes in the stomach (preferably passed through a nostril), in the rectum, or passing both ways in an enterostomy merit more general adoption. Hypodermoclysis is positively indicated, as no fluid should be allowed to remain in the rectum and nothing should be given by mouth.

to positive operative indications, dangerous dissemination of infection from a localized or a localizing process or the addition of distress, inseparable from any form of intervention, which would be intolerable under certain conditions of temporarily reduced resistance, are real problems to be solved in terms of the patient's best interests.[10]

Many cases clear up without operation and in some none is indicated thereafter (e. g., case of puerperal infection cited above) in others a subsequent appendectomy, for example, is wisest. Perhaps more frequently in the serious cases a localized peritonitis (abscess) is formed which must be drained, usually as a minor procedure, the primarily offending lesion to be corrected later, though this may be unnecessary, as, for example, a non-obstructing ulcer of the stomach or duodenum that has perforated, and thereby led to its own cure.

This general plan of treatment irrespective of operation should be maintained just a little longer than absolutely is necessary in order to be sure that there are no longer active organisms left in the peritoneal cavity. In general it is best to wait till the patient has been quite normal for a few days, then to begin the administration of water by mouth in small amounts at intervals of about two hours to see if any pain results, which would be a signal to stop. Otherwise larger amounts may be given more frequently, later adding a little egg white and finally giving it concentrated with a little flavoring. The diet, if no untoward symptoms appear, now may gradually be increased to broths and soft eggs but avoiding carbohydrates. As soon as it is evident that peristalsis will not reawaken the inflammation a dose of castor oil should introduce a general diet.

No peritonitis subsides without some adhesions, past friends that may now become enemies. Adhesions are alleged to be absorbed. The longer they have existed beyond seventy-two hours the more they are composed of fixed tissue which is insoluble. Adhesions disappear by being pulled loose, retracting towards their points of attachment where they probably readhere and are overgrown with serosa.[11]

That arch enemy peristalsis now becomes a friend in time of need, for by increased peristalsis recent adhesions are stretched to the breaking point and thereafter if the peristalsis continues they do not become reattached to opposing surfaces. A patient is easily interested in one form of after treatment now indicated; the frequent ingestion of solid food. Repeated catharsis is repugnant, but is also very essential. The efficacy of these details in treatment has been established by observations made at subsequent operations when adhesions, seen at a former operation or known to have been provoked then by drainage, had disappeared; and also the *apparent* freedom of individuals so treated from postoperative intestinal obstruction.

[10] Agreement is fairly general that operations should afford the most certain relief from the greatest amount of toxins with the minimum of reduction in resistance. No discussion of the many details of this unsettled problem will be attempted aside from the question of peritoneal lavage. This procedure does cause dissemination, as Mikulicz proved that not all of the lavage water could be recovered, and increased dissemination does cause increased absorption. At one time much is presented in behalf of the benignancy of phagocytes, at another a fearful outcry is made over the malignancy of an accumulation of phagocytes now condemned as an enemy and given the epithet pus. The real concern is the elimination of the cause of the purulent exudate, the prevention of extension to unaffected areas, and to avoid otherwise putting the entire organism more on the defensive. Repeatedly has the observation been made at operation and postmortem that the purulent exudate, commonly was sterile, although virulent bacteria existed in the fibrinous exudate upon the peritoneum. If it were possible even to wash the peritoneum microscopically clean there would still remain bacteria sufficient to reproduce the comparatively harmless conditions that were being remedied. Accumulations of gastro-intestinal contents or pus should gently be bailed out but surgery becomes meddlesome when it attempts to help physiological functions that proceed the more certainly without interference.

[11] In this connection it is well to remember that adhesions resulting from infectious peritonitis are more evanescent than those caused by physical irritation; indications for the greatest possible limitation of drainage. The histogenesis of adhesions forming about a drain in dogs and man (determined by observations upon one case of appendicostomy and one case of colostomy) is virtually identical, fixed tissue proliferation is present in seventy-two hours.

Rational curative treatment is seldom without some features of prophylactic bearing and though much cannot be done to prevent peritonitis without the possibility of eradicating the causes, nevertheless a little can be accomplished by way of making that peritonitis less severe when it does come. Individuals, for example, with chronic appendicitis, gastric or duodenal ulcer, gall-stones, or hernia, or those predisposed to volvulus, and patients in whom postoperative adhesions are probable, all should be warned of the dangers of food and cathartics in acute abdominal upsets and of the necessity of prompt, efficient, surgical attention under such conditions.

If trouble be taken to make careful inquiry it is remarkable how seldom a fatal case of peritonitis has not come to its advanced development, and rapidly, after some food or laxative has been taken, particularly if it be remembered that half a glass of milk or an aloin pill suffices to transform almost certain localization into hopeless dissemination.

In conclusion, the "becauses" briefly may be epitomized. The gratifying results of this plan of treatment have not warranted the substitution of other methods contrary to the physiological principles here presented, principles that appear to demand the character of the therapy outlined.

THE BLOOD PRESSURE INDEX OF ECLAMPSIA[1]

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THE greatest danger confronting the pregnant woman is eclampsia. Concerning its origin and treatment little progress has been made and the death rate is still in the neighborhood of twenty-five per cent.

Suddenness of onset in an apparently healthy woman is one of the characteristics of the disease and from time to time various clinical signs or symptoms have been heralded as indices to the pre-eclamptic condition. In about one-fourth of the cases there are present certain premonitory subjective signs which are indisputable, but the convulsions may follow in a few hours so that there is hardly time to adopt any preventive régime.

For many years changes in the urine have been considered the earliest premonitory signs but the value of these changes have been greatly overestimated. Albumin and casts are almost always present in the pre-eclamptic stage and in the actual condition they are usually present in considerable amount and numbers, but numerous attacks occur while the albumin exists only as a trace, in fact scarcely more than might be considered the normal or physiological albuminuria of pregnancy. Indeed it is probable that the disease is an autotoxic condition produced or accompanied by degeneration of the liver cells and that the kidney lesion is only a secondary one. Seventy-five per cent of the cases show no abnormal urinary signs a short period after delivery (1).

Percentage urea as determined by the common clinical tests is of no value. When the amount of urine passed during twenty-four hours can be measured and the total nitrogen and the urea nitrogen can be determined by chemical laboratory methods, distinct value may be assured. Further, if any definite value is to be given this index it must be determined every two or three days in the last month of pregnancy instead of weekly or fortnightly as the general custom is at present. The time necessary for such an elaborate series of tests would place the cost of this form of insurance so high that it would not be acceptable even to the very wealthy.

A number of times the attention of the

[1] Read before the Bellevue Alumni Association, May 3, 1911.

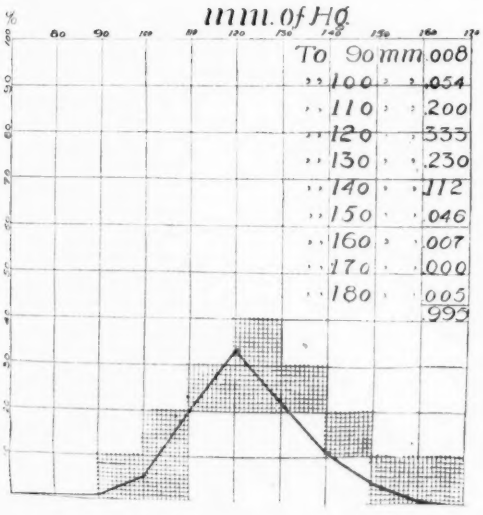

Chart I. Range of blood pressure in 1,136 readings on 145 women.

profession has been called to the value of blood pressure as an index to the onset of the eclamptic condition. Much credit is due to Janeway for the clear way he has presented this subject in his book on blood pressure. To determine the value of this index several factors must be considered.

First. What is the average blood pressure of the normal woman in the latter months of pregnancy, and what are the causes of variations from this average?

Since October, 1909, it has been the custom on Dr. J. C. Edgar's Bellevue service to make frequent blood pressure readings on the waiting women. Most of these examinations have been made therefore in the last four or five weeks of pregnancy.

In 1,136 systolic readings on 145 women it has been found that the average blood pressure is 118 mm. of Hg. These readings were made with the wide cuff Stanton instrument and do not include readings taken on the day of labor. J. C. Hirst (2) also found the average to be in this neighborhood. To state an average in this condition gives a very inadequate picture for many women have decided variations in the pressure taken at different intervals. I have made a diagram showing quite accurately the range of pressure in these 1,136 readings.

It will be readily seen that these readings vary greatly but that there is a high limit rarely passed. This is quite in accord with Janeway's statement (3) that a tension above 160 mm. does not exist in normal pregnancy. Some women run a continuously low blood pressure without apparent cause. Chart II shows the readings of a perfectly healthy multipara.

Many women run a continuously moderate blood pressure which is little affected by the ordinary occurrences of ward life, but by far the most numerous are those having from day to day an irregular range of blood pressure.

As far as it could be determined there was no regular variation in the readings from primaparæ and multiparæ. Of these women

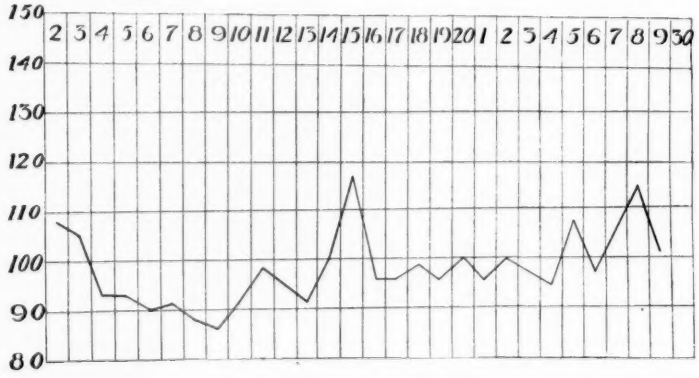

Chart II. Low range of blood pressure, last month of pregnancy, June, 1910.

28 per cent showed a variation of 25 to 30 mm. during the course of some days.

A study of the nitrogen partition of the urine of the women who have marked changes from day to day has so far been found to be of little value, but this work is being continued with the hope that slight changes of metabolism may be coincident with increased pressure and thus a control be found for this index.

Observations through the remainder of the pregnancy in this type of case lead to the conclusion that changes of 30 mm. above the normal average (118) mean very little from a practical standpoint. Excitement, exertion, digestion, rest, and sudden changes of position all tend to produce changes up to 10 mm. but seldom more than this amount. Chart IV taken from Crile's book on blood pressure shows physiological variations according to Weiss (4) His estimations were made with the tonometer.

The onset of labor tends to raise the blood pressure. In the first and second stages of labor 140–150 mm. may be considered a fair average, if taken between the pains (5).

Second. Is the blood pressure invariably high in eclampsia and at about what point may it be considered as abnormal or as evidence of the pre-eclamptic state?

Eclampsia is a toxæmia or autotoxæmia which has for its most prominent or striking symptom the convulsive seizure. The toxæmia of the early months of pregnancy is often followed by the eclamptic condition in the latter months and it has been said with reason that the eclampsia is only a further

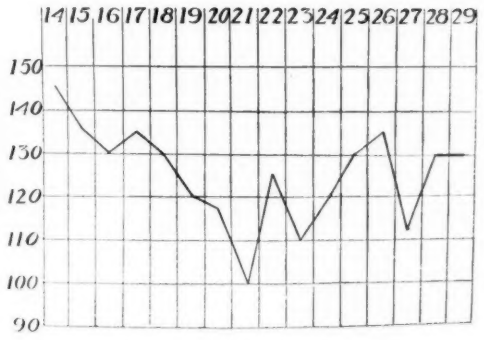

Chart III. Irregular range of blood pressure, last month of pregnancy, June, 1910.

product or advanced condition of the autotoxic state occurring in the early months (6).

Examinations of blood pressure in early toxæmia in our own cases and the cases of others were invariably low. Apparently toxic substances are circulating in the blood which have marked influence on the vomiting center, but with little action on the vasomotor apparatus either central or peripheral.

In the developed toxæmia of the latter months there is usually present a blood pressure raising principle or else by hormone action or similar means the pressure is raised to increase the natural resistance of the body. The fact that in the fulminant type of fatal toxæmia in the latter months the blood pressure is very low points more to the latter idea and also tends to more closely associate the early and late manifestations of poisoning that occur in these women.

To show how frequent these fulminant types

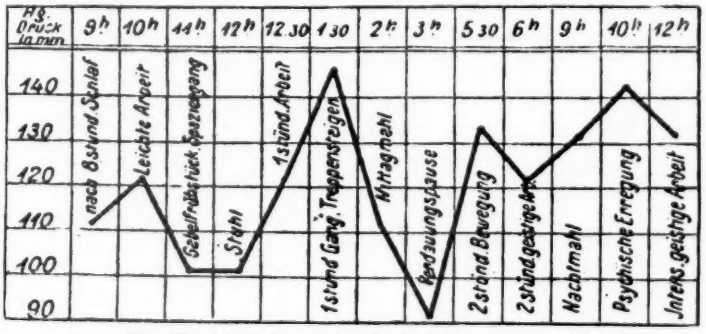

Chart IV. Physiological variations in the blood pressure. (Weiss.)

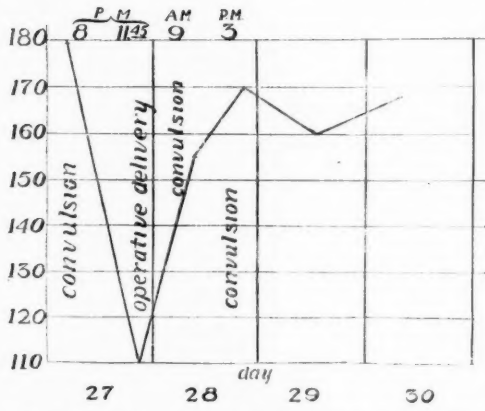

Chart V. Eclampsia convulsions occurring at moderate blood pressure, November, 1910.

are a description of two cases will be given that occurred on the Bellevue service during the past year.

CASE 1. K. F., para five, about 7½ months pregnant was admitted to Dr. Edgar's service at Bellevue, April 8, 1910. She was brought in as a case of alcoholism having been found in a stuporous condition in one of the city parks.

On admission she was semiconscious and cyanotic. She frequently vomited large quantities of black watery fluid which on examination was found to contain blood. Her general condition was poor, the blood pressure was 70, and the pulse could barely be felt at the wrist. The urine which was black was found to contain a large amount of albumin and hyalin, granular and epithelial casts. No fœtal heart sounds were heard. Her stomach was washed and she received caffeine, strychnine, hypodermocylisis and high colonic irrigation. Four hours after admission a hydrostatic bag was inserted into the uterus without anæsthesia and ten hours later she expelled a dead 7–8 months fœtus, the placenta coming away shortly afterward. Blood pressure just before delivery was still 70 mm. Catheterization at intervals obtained in all but 16 ounces of urine. The morning of the following day she appeared somewhat better, was excreting more urine and the blood pressure was 80 mm. She died 33 hours after admission.

CASE 2. M. S., multipara, seven months pregnant, was admitted to Dr. Edgar's service at Bellevue Hospital, October 31, 1910. She had been several days in a police station charged with intoxication. On admission she was stuporous, irrational, and unable to give any history. She had dyspnœa, air hunger, and a faint radial pulsation. The heart was irregular and the blood pressure could not be obtained. Her urine was loaded with albumin and casts and was dark in color. She received stimulation and saline intravenous infusion. On November 1st, she was a little better and her blood pressure was 75 mm. A 7 months fœtus was protruding into the vagina and was removed together with the placenta. She continued to improve, the blood pressure on November 3d reaching 80 mm. but the urine was scant in quantity (eleven ounces on November 1st, 13 oz. on November 2d) and still contained albumin, blood, and casts. She vomited frequently. On November 4th, or four days after admission, she developed a pneumonic process in the right upper lobe and died within twelve hours.

While these two cases may be considered unusual the point to be emphasized is that a severe toxæmia may exist without convulsions and without high blood pressure, but in every other way similar to eclampsia.

While it is generally known that cases of eclampsia at the time of the convulsions usually have high blood pressures, still convulsions occur when the pressure is as low as 155. Chart V shows the blood pressure readings of a typical case where the pressure was but moderately high.

Vogeler (7) and also Green (8) have attempted to classify the cases where the pressure was above the normal. In Vogeler's classification the high pressures are separated into three groups:

1st: Those moderately elevated and due to acute or chronic nephritis, 2d, those due to arteriosclerosis and 3d, those due to eclampsia.

This classification or any classification not taking into account the individual can hardly hold good. While it is true that the blood pressure is raised in both chronic parenchymatous and chronic interstitial nephritis, it would appear that the height of the pressure would be controlled by the coincident cardiac hypertrophy and vessel sclerosis.

Marked arteriosclerosis of itself does not occur at the age at which eclampsia is common.

It is evident then that convulsions in eclampsia though usually occurring at a time when the blood pressure is in the neighborhood of 200 may occur when the pressure is as low as 155, and furthermore that the eclamptic toxæmia may be even more severe when the pressure is very low. From the analysis of blood pressure readings by many observers 150 mm. may be taken as a danger limit and any pressure above this should

demand rigorous investigation and treatment. Special mention should be made of Vogeler's conclusions to the same effect.

Third. What treatment should be adopted if the blood pressure index is accepted as indicating toxæmia?

The treatment should be entirely concerned with eliminating and limiting the production of the poisons. This may often be accomplished by active catharsis, sweating, diuresis, and limiting the nitrogen intake by placing the patient on a low calorie milk diet.

With the elimination of the toxins the blood pressure falls and this fall may possibly be an indication of the extent to which the treatment should be pushed. Even if convulsions ensue there is no reason to direct efforts to the lowering of the blood pressure, for the chronic nephritic and the arteriosclerotic individual goes about with a relative amount of safety with a blood pressure of 200 mm. There is every reason to suppose that the resilient arteries of these comparatively young women are equally able to withstand such a blood pressure.

If vessel dilatation is adopted by action on the medullary centers of such a drug as veratrum viride true collapse is produced (9). This effectually stops the convulsions it is true but it leaves the patient in a condition similar to those cases of the fulminant type of the disease cited in this paper.

If vessel dilatation is adopted by means of such drugs as nitroglycerin and erythrol tetranitrate which act for the most part at least on the peripheral mechanism of the blood-vessels, shock or collapse does not occur, but the natural resistance of the organism toward the poison is reduced and the index to the success of the eliminative treatment is destroyed. I am not entirely convinced that when the pressure is over 200 mm. it may not be wise to reduce it to approximately that limit. It is well to remember the work of Wallace and Ringer (10) which shows that with high pressures the nitrite group is almost invariably successful in accomplishing an 11 to 14 per cent reduction of the pressure.

The history of the disease shows that eclampsia rarely occurs as late as five days

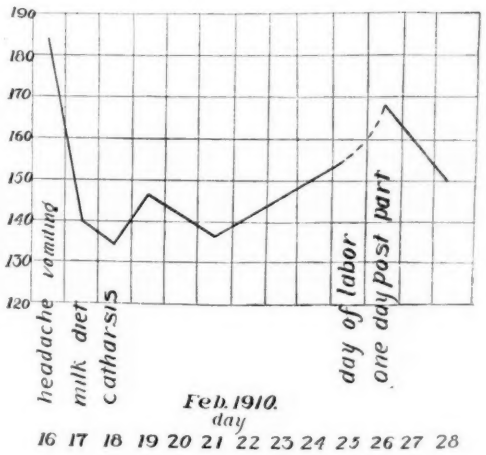

Chart VI. Pre-eclampsia; rest, catharsis, and milk diet.

after delivery and that postpartum eclampsia is never as fatal as the antipartum or intrapartum conditions. The logical deduction is that the uterus should be emptied in all cases resistant to eliminative treatment where the blood pressure is high and is increasing.

Triweekly blood pressure examinations in the last four weeks of gestation will give the closest clue to the pre-eclamptic condition

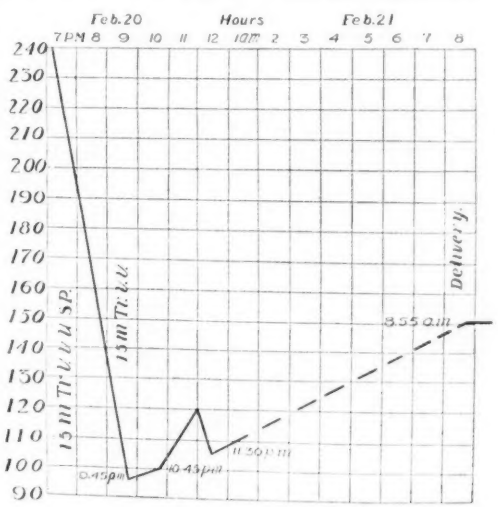

Chart VII. Blood pressure. Pre-eclamptic state; veratrum viride action, fall of 145 mm. Hg. within three hours.

obtainable at present and while not infallible offers, combined with the ordinary methods now employed, the best index.

CONCLUSIONS

1. Average blood pressure in the last weeks of pregnancy is 118 mm. of Hg. Fluctuations amounting to 30 mm. of Hg. above this need cause no alarm.

2. Blood pressure over 150 should be thoroughly investigated at once.

3. Blood pressure in eclampsia with convulsions, though usually in the neighborhood of 200 mm. of Hg., may be as low as 155 mm.

4. Convulsions do not occur when the blood pressure is lowered by poor resistance as in the so-called fulminant cases or when lowered by veratrum viride or other drugs producing collapse.

5. Treatment should be directed not toward reducing the blood pressure but to the treatment of the toxæmia for the rise of blood pressure may denote only the resistance of the system toward the toxins.

6. Triweekly blood pressure examinations combined with the regular urine examinations for albumin and casts offer the best safeguard against the unexpected presence of this disease.

I am indebted to my friend Mr. Frederick Wengenroth for the drawing of the charts.

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A REVIEW OF SEVENTY-THREE CASES OF DUDLEY'S OPERATION FOR DYSMENORRHŒA AND STERILITY[1]

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HISTORY

BLOODY discission of the cervix for sterility and dysmenorrhœa has been practiced since 1843, when Simpson[2] first described it. He was closely followed by Jobert,[3] who, however, came upon the procedure independently. It was Sims,[4] however, who popularized the operation and modified it by making the incision in the posterior lip of the cervix instead of bilaterally as his predecessors had done. As might have been expected, there was at first a tremendous following for the operation, succeeded by an equally strenuous opposition. The reason for the latter lay in the operation being performed without proper or sufficient indications, and upon all sorts and conditions of women. For a long time the operation was vigorously condemned. When the era of asepsis appeared, however, this procedure, like many others, was rehabilitated, as the inflammatory reactions which were not uncommon as a sequel to the operation, no longer appeared. The operation had no modifications until 1873, when Courty[5] suggested uniting the wound surfaces by suture. This rendered the operation safer, as it provided against secondary hæmorrhage, of

[2] Med. Times and Gaz., Feb. and March, 1859.
[3] Jobert: Malgaigne, Jour. de Chir., v. i, p. 265.
[4] Clinical Notes on Uterine Surgery. N. Y., 1873, p. 153.
[5] Gaz. hebdom. de méd. et de chirurgie, May 9, 1873.

[1] Read before the Metropolitan Medical Society, March 28, 1911.

which many of the earlier authors had complained, although Sims (loc. cit. p. 157) speaks of it as being usually insignificant.

It was not until 1891 that E. C. Dudley, of Chicago, proposed his operation, which can best be described in his own words.[1]

"The operation has for its object the utilization of dilatation and of posterior incision of the cervix in such a way as not only to enlarge the caliber of the uterine canal, but also to straighten the uterus, and thereby to overcome the circulatory obstruction. The operation is performed as follows:

"The uterine canal is dilated sufficiently to permit the introduction of a small, sharp curette. Curettage is performed. The curettage may give only negative results, and may be, therefore, simply exploratory; or it may give evidence of pronounced endometritis. If the latter, it is imperative as a preliminary aseptic step, not only to the plastic part of the operation, but also as a curative measure. The cervix is incised with scissors behind in the median line, posterior to the uterovaginal attachment, nearly into the uteroperitoneal fold in the pouch of Douglas.

"The cut surfaces thus incised are then held widely apart by means of the two tenacula in the hands of an assistant; the incision is somewhat deepened by means of a scalpel, especially in the uterine wall next to the cervical canal, and a small angle is cut out on either side. The cut surface on each side is now folded on itself by a single silkworm gut suture. This suture is tied, and fortified by interrupted sutures on each side. By means of these sutures the os externum is carried directly back to the angle of the incision. The cervix now points backward in its normal direction, toward the hollow of the sacrum, instead of forward toward the vaginal outlet.

"When there is an unusually long anterior lip, this should be caught with a tenaculum, and partially removed with the scissors."

Another, and essentially different operation, based principally on the procedure of Simpson, has been described by Pozzi;[2] but as this does not come into conflict with Dudley's operation in any way, I shall do no more than mention it at this time.

In this paper, which is intended to be a purely clinical report, I have not discussed the varieties of dysmenorrhœa nor the ultimate causes of sterility, and I have confined myself to a consideration of our own cases without entering upon fields of dispute.

In the First Gynecological Service at Mount Sinai Hospital, this operation, with some modifications, has been performed 106 times in the past six years. The modifications have consisted of four factors. The principal one has been the omission of the denudation of the anterior wall, which we have not considered essential to the proper development of the operation, and which Dudley also now dispenses with. The second has been the occasional, but infrequent, omission of the excision of the wedge-shaped piece of the posterior lip of the cervix. The third consists in the wide dilatation of the cervix, which renders the operation easier; and the fourth consists in using chromicized catgut where Dudley employs silkworm gut to close the cervical wound.

The performance of the operation is exceedingly simple, and offers no technical difficulty. We have found it of advantage both as to speed and security to have the suture attached to a needle at each end, and to start the suture at the superior or anterior portion of the incision, tying it in the posterior fornix behind the cut edge of the cervix.

In all of the cases the operation proper has been preceded by a thorough and prolonged dilatation of the cervical canal and a light curettage. The cervical dilatation is a very essential feature inasmuch as it permits of the easier manipulation of the posterior lip of the cervix after it has been incised. We have often found it necessary also to ligate a small branch of the circular artery of the cervix which is cut into when the wedge-shaped piece of the cervical tissue is excised. In all other respects we have followed the directions of Dudley as given in his original article and in his book.

One of the direct results of this operation is that the position of the os externum in the vagina is changed. Instead of lying against

[1] A Plastic Operation Designed to Straighten the Anteflexed Uterus. Amer. Jour. Obstet., 1891, v. xxix, No. 2. Also in his Principles and Practice of Gynecology, Phil., 1908, p. 723.

[2] Pozzi: Trans. Amer. Gyn. Soc., 1909, p. 360.

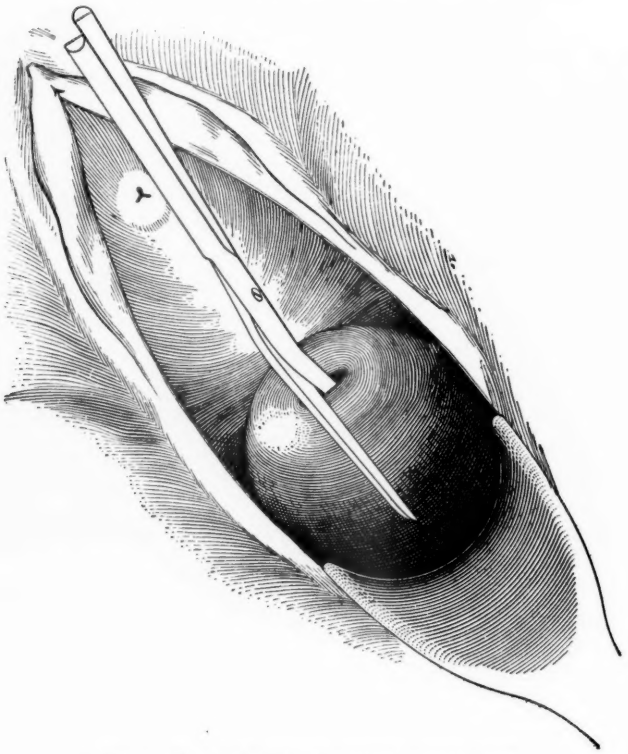

Fig. 1. Showing incision in posterior cervical wall.

the anterior vaginal wall, if the uterus is in sharp anteflexion, or midway between the anterior and posterior vaginal wall, if the uterus is moderately anteflexed, it now points toward the posterior wall. In this way the reception of the semen into the uterus is very much fostered; for, as many writers have pointed out, if the cervix lies against the anterior wall, access of the semen to the uterus is practically excluded.

Another and striking result is the change which takes place in the curve of the uterine canal. Whereas before operation the uterus lay in very marked anteflexion, with a most marked curve, as soon as the suturing is completed the sound will be found to follow practically a straight course toward the fundus. It is easy to understand why this should be so, for the entire direction of the lower portion of the uterus is changed, the cervix pointing directly backward.

It matters very little whether Olshausen [1] is correct in his belief that the external os plays no rôle in the causation of dysmenorrhœa and that the blame must be put entirely on the internal os; or whether Jaquet [2] is right in the diametrically opposite faith. In the operation as devised by Dudley both the external and the internal os are divided, and both are changed in direction and in becoming more patulous.

While we have tried other measures for the relief of both sterility and dysmenorrhœa, this report will deal only with the results of the Dudley operation.

[1] Ueber Amenorrhœa und Dysmenorrhœa. Zeitsch. f. Geburts. u. Gynäk., 1904, v. li, p. 226.

[2] Ueber die Diszision des Muttermundes. Zeitsch. f. Geburts. u. Gynäk., 1901, v. xlvii, p. 144.

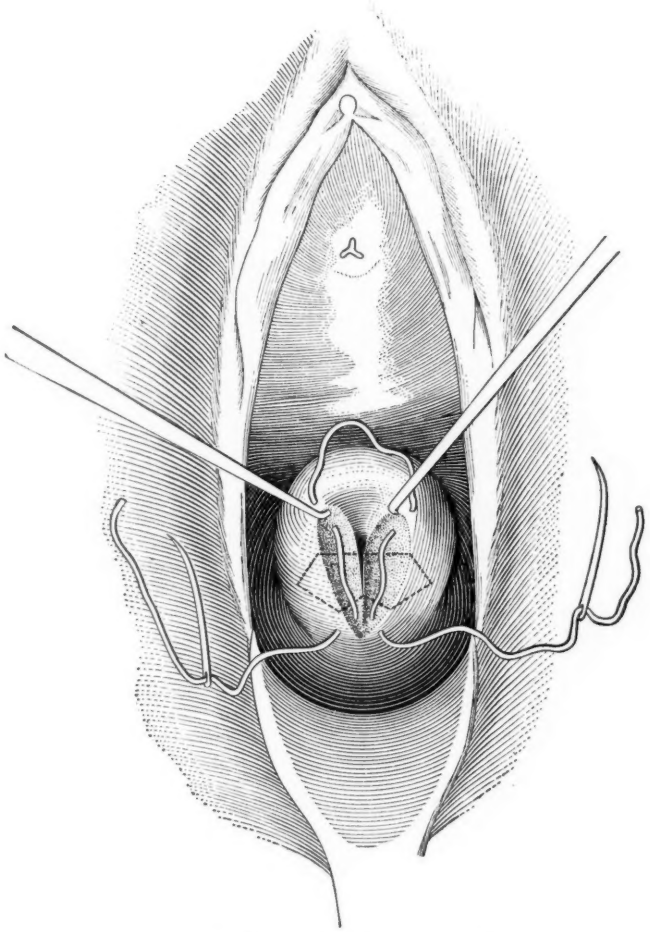

Fig. 2. Showing insertion of sutures.

In every case operated upon by us (Drs. Brettauer, Frank, and myself), selection was carefully made. Thus, in every instance, an examination of the husband was made to preclude the possibility of his being responsible for the sterility. Contraindications were carefully studied in both the cases of sterility and dysmenorrhœa. No patient was subjected to the operation who had ever had inflammatory pelvic disease, or in whom there was any gross pathological condition of the pelvis, or in whom there was diabetes, nephritis, tuberculosis, or grave cardiac disease. We have not considered a contracted pelvis as a contraindication, as patients with this condition can be properly taken care of when they become pregnant. A few of the patients had small, hypoplastic uteri; but although an infantile uterus does not offer a promising result, it was not looked at as a contraindication to operation, since it might give relief to the dysmenorrhœa for which the patient came to the hospital. Many of the patients suffered from a non-specific form of

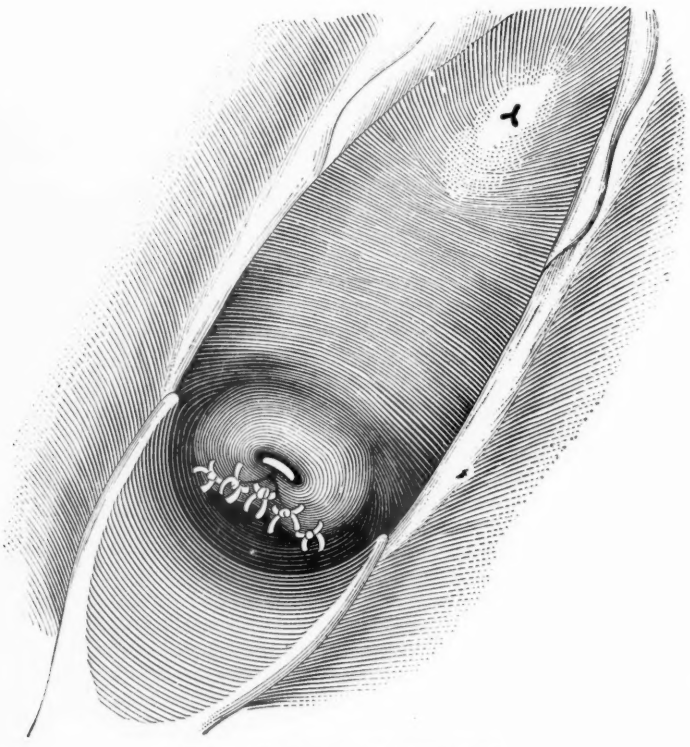

Fig. 3. Showing operation completed.

endocervicitis, which has been recognized by Kelly [1] as a source of dysmenorrhœa.

The majority of patients gave microscopic evidence of a chronic endometritis, although very few complained of leucorrhœa.

In general the patients presented themselves with a history of mere sterility, dating from eight months to twelve years. They complained of nothing else. In our ward patients this is a serious complication of married life, for most of them are Russians or Poles; and if they remain barren, they are eventually deserted or divorced [2] by their brutish husbands. The other general class of patients complained only of dysmenorrhœa, varying from slight pain to severe agony. Many of the married women sought relief from both dysmenorrhœa and barrenness.

The usual finding was a small, anteflexed uterus with a long, conical cervix. In many instances the external os could not be passed by a sound. This constituted, in the absence of the contraindications above noted, an indication for the Dudley operation.

I have recently made a circular inquiry of the 106 patients, and answers were received from 52 ward patients and 21 private patients; a total of 73. Thirty-three letters were returned, the persons not being found by the post-office department. I have kept the reports of ward and private patients separate, for the private patients were of a different walk in life, and it seemed interesting to compare results. The following tables give the summary of the results as shown in

[1] Medical Gynecology.

[2] Through the efforts of several charitable institutions, the divorces or desertions of women of this class have become markedly diminished in recent years.

the replies received, not all of the patients answering all the questions.

TABLE I

Ward patients, 52. Twenty-nine applied for relief of dysmenorrhœa, and 29 for dysmenorrhœa and sterility.

Dysmen. Relieved.	Dysmen. Not Relieved.	Dysmen. Worse	
16 55.1+%	12 41.3+%	1 3+%	
Sterility Relieved.	Sterility Not Relieved.	Instrumental Delivery.	Abortions.
5 17.2+%	24 83.8—%	1 20% (of the relieved cases).	1 (of the relieved cases).

TABLE II

Private patients, 21. Thirteen applied for relief of dysmenorrhœa, and 19 for dysmenorrhœa and sterility.

Dysmen. Relieved.	Dysmen. Not Relieved.	Dysmen. Worse.	
11 84.6%	2 15.4%	0	
Sterilty Relieved.	Sterility Not Relieved.	Instrumental Deliveries.	Abortions.
8 42.1%	11 57.9%	3 15.8% (of the relieved cases).	0

The percentages are based upon the actual answers received, not upon the total number of replies received. At a glance it is evident that the private patients were much the gainers by the operation, both as to the relief of the dysmenorrhœa and the sterility. It is difficult to account for this. Possibly the poorer living conditions, so far as food and rest and hard work are concerned, play some rôle; but I have no more definite reason to offer than this, for the cases were selected with equal care.

Combining the figures for both classes, we have this table:

TABLE III

Patients, 73. Forty-two applied for relief from dysmenorrhœa, and 48 from dysmenorrhœa and sterility.

Dysmen. Relieved.	Dysmen. Not Relieved.	Dysmen. Worse.	
27 64.3%	14 33.3+%	1 2.4%	
Sterility Relieved.	Sterility Not Relieved.	Instrumental Delivery.	Abortions.
13 27%	35 73%	4 8+%	1 2+%

TYPICAL CASES

Case 1. Dysmenorrhœa, anteflexion, long, conical cervix; Dudley's operation. Miss E. W., consulted me in October, 1906. She is a college student 19 years of age. Her menses appeared at 14, always regular, lasting 4 to 5 days, not profuse. On the day preceding the appearance of her menses she had terrific pains, which lasted for 48 hours. After the expulsion of a clot at this time, her pain diminished. She was obliged to be in bed for three days. Examination showed a long, thick, conical cervix, with a normal sized, sharply anteflexed uterus. She was operated at Mount Sinai Hospital, Dec. 15, 1906. It was a typical Dudley operation. Recovery uneventful. From that time on the menses have been practically painless. The patient could continue her studies uninteruptedly, and was never obliged to go to bed during her period. She subsequently married, and was delivered by me on April 1, 1910, by low forceps.

Case 2. Dysmenorrhœa, retroflexion, long, conical cervix; Dudley's operation and ventral fixation. Miss A. M. S., a dancing teacher in a western city, consulted me July 1, 1901. She was 35 years of age. The first menses were at 13, regular, of the 4-weekly type, lasting 5 to 6 days. She had no pain until her 18th year. Since then she had been obliged to remain in bed for three days She had vomiting and intense pain. The flow was scant at first, often clotted, and there was a feeling of bearing down. There was no vaginal discharge. This patient had had local treatment. She had worn a cervical pessary, had had electrical treatment, and had been under Christian Science care. The examination showed an easily dilatable hymen, a long, hard, conical cervix, pointing to the symphysis, and a very sharply retroflexed, movable uterus. She was operated at Mount Sinai Hospital, July 3, 1909. It was a typical Dudley operation followed by ventral fixation. Recovery uneventful. I have had repeated letters from this patient, the last one a month ago. She is free from all pain, conducts large private classes in dancing, and leads the children of her city in folk dances.

Case 3. Sterility; Dudley's operation. Mrs. F. W. M., aged 37, married two years, never pregnant. She was first seen April 6, 1906. She had menses since the 14th year, always regular, somewhat painful on the first day, not profuse. She was very anxious to have a child. Examination revealed a hymen stretched rather than torn, with a very small opening. The uterus was anteflexed, with a long, conical cervix. The husband's semen examined by Dr. F. S. Mandlebaum, was healthy. The patient was given advice as to various procedures to assist her in becoming pregnant, but these did not avail. Operation was performed at her home on May 12, 1906, with the assistance of Drs. R. T. Frank and Bennett, by excision and suture of hymen, and typical Dudley's operation. The recovery was uneventful. On May 29th the cervix pointed downward and backward, and the external

os easily admitted the sound. This patient went abroad the following month and conceived in July, 1906, being delivered by me in May, 1907. I have since delivered her again in 1910. In this case there can be no doubt that the pregnancy followed as a direct result of the operation.

CASE 4. Sterility and dysmenorrhœa, anteflexion, stenosis of external os; Dudley's operation. Mrs. M. E. M., 26 years of age, married 2 years; first seen September 20, 1904. Has never been pregnant. First menses appeared at 14 years, regular, every 27 days, lasting about 3 days. The first day was spent in bed on account of great pain (cramps). Examination showed a sharply anteflexed uterus and a long, conical cervix. The husband had had gonorrhœa, but his semen contained living spermatozoa. She was operated at her home November 20, 1904, with the assistance of Dr. W. M. Brickner. It was a typical Dudley's operation, with convalescence uneventful. The patient became pregnant on the first intercourse following the operation, one month later, and was delivered by me in October, 1905, after a normal labor. She is again pregnant now. This is a case in which, after two years of married life, the patient failed to conceive until the stenosis of the cervix and the anteflexion were corrected by operation.

THE CERVIX IN LABOR, AFTER DUDLEY'S OPERATION

I have delivered seven women upon whom the Dudley operation had been performed for the relief of dysmenorrhœa and sterility. In not one of them was there anything in the conduct of the labor out of the ordinary. In two of them a low forceps operation was necessary, but as far as dilation of the cervix was concerned, the first stage in all was absolutely normal. The reason for this lies undoubtedly in the fact that the wound in the cervix is a clean cut one, and heals, almost without exception, primarily. So that we have a cervix even more favorable for dilatation during labor than one upon which a trachelorrhaphy has been performed, since we have no scar tissue to contend with. I have watched the wounds in these cervices with especial care and interest. In a few months, the posterior lip of the cervix feels no differently than the anterior lip. It is just as soft and smooth; but the site of the incision can be palpated and seen although it is not rough and hard. As far as the conduct of the cervix itself is concerned, then, during labor, Dudley's operation offers no contraindication.

It would be unfair to Dr. Dudley not to mention the fact that in the Zeitschrift für Geburtshülfe und Gynäkologie, 1908, vol. lxii, p. 465, there appears an article by Dr. Ludwig Herzl, from the clinic of Professor G. Lott in Vienna, entitled: "Über die hintere sagittale Diszision der Cervix uteri." In this paper the author described posterior sagittal discision or incision of the cervix as practiced in the clinic of Professor Lott. Herzl does not say how long this method has been practiced by Professor Lott, nor when he began to use it. This is unfair and unprofessional, and unethical; and I wish emphatically to protest against it, and to say that this particular operation belongs to the credit of Dudley, of Chicago. Nowhere in the literature is there a description of any similar procedure except in the paper I have mentioned; and this was printed in 1908, while Dudley described his operation in 1891.

SUMMARY

1. Dudley's operation of posterior sagittal incision of the cervix with or without the excision of a bilateral wedge, for the relief of dysmenorrhœa and sterility, is a procedure to be recommended.

2. It is of greater service in the relief of dysmenorrhœa than of sterility, although in the latter the effect is sometimes magical.

3. The resulting scar in the cervix offers no hindrance to labor, dilatation being as normal as possible.

4. Pathological anteflexion, or retroflexion of a hypoplastic uterus, with stenosis of the external or internal os, or of both, is a frequent cause of sterility and of dysmenorrhœa.[1]

5. These conditions can be relieved in about 50 per cent of properly selected cases by Dudley's operation; but no operation for sterility should be performed until the husband is found to possess living spermatozoa; and no operation should be performed for dysmenorrhœa without a thorough study of all the features of the case, for there are cases which yield to no form of operation.

[1] In this statement I do not agree with Norris and Barnard (Amer. Jour. of Obstet., May, 1910, p. 765), but this, of course, is a matter of personal judgment.

ACIDOSIS [1]

By BENJ. BRABSON CATES, M. D., Knoxville, Tennessee

IN studying the relative chances of a patient surviving a given operation, the question of acidosis, acid intoxication, or acetonæmia should receive the surgeon's careful attention.

When we know that of the 400 cases observed at the Boston City Hospital, 46 showed signs of acidosis; and of these 46 cases, there was a mortality of 6 or 13 per cent, we should well believe it of such importance as to warrant more than passing notice.

While the presence of acetone as a cause of mortality was considered of pathological significance as early as 1854, I doubt if it was not more the presence of unrecognized B-oxybutyris, and diacetic acid than acetone.

However that may be, it is only of comparatively recent date that clinicians have awakened to the danger of this new foe as a complication of disease other than diabetes, and more especially as a factor of dire calamity in the surgeon's mortality report.

This late recognition of acidosis may perhaps receive plausible explanation when we remember the literature is so scant, and the text-books have so little to say on this question. And no doubt, on this account, many fatal cases developing acidosis, following an otherwise ideal operation, have puzzled the surgeon's mind for a rational interpretation. Rationally the etiology of this acidosis is largely academic.

Inasmuch as the subject has not been thoroughly investigated in all its phases, since many important points are as yet imperfectly understood; nevertheless the pathological findings which show advanced regressive textural changes in the tissues — owing to toxine circulating in the blood — might suggest imperfect oxidation of proteids in the body.

Aside from the many theories that have been advanced as to its etiology, J. A. Kelly assumes the condition of acidosis due to one similar to that found in uræmia, and acute yellow atrophy of the liver. He bases his opinion on the autopsy findings of fatal cases occurring at the Boston Children's Hospital. These fatal cases did not show "evidences of intracranial pressure," the clinical "symptoms in some cases, however, were those of cerebral pressure, and all had fatty liver." He is corroborated by Guthrie.

That this condition of acidosis is not limited to fatal cases of diabetes is shown by Kelly's tabulation of all the cases reported in the literature, and which I herewith quote, and to which I invite your careful attention, to wit: (1) Diabetes mellitus; (2) in starvation; (3) in malignant growths; (4) in digestive disturbances; (5) in septic processes; (6) in infectious fevers; (7) in pregnancy associated with dead fœtus; (8) in certain psychoses; (9) in autointoxications; (10) in chronic morphinism; (11) in phosphorus poisoning; (12) following general anæsthesia; (13) in injuries to cerebrospinal system; (14) in shock due to injury; (15) in cases associated with fatty liver; (16) in cases of uræmia.

To which I may add two cases following general anæsthesia; one case of sepsis, and one case of digestive disturbance, probably malignant degeneration of the stomach.

It has been produced experimentally by phloridzin and oleic acid; also, by extirpating the pancreas, and solar system.

From a study of Kelly's cases it is manifest this condition has an extensive morbidity, and no doubt pays an insidious visit to many patients, which may also account for periods of ebb and flow in convalescence following operation.

It is fair, however, to say in this connection since some observers believe this condition develops solely as the result of a general anæsthetic, such supposition is largely conjecture and open to criticism, because no substantial record of observations has been offered in proof of such a claim.

Some clinicians affirm chloroform especially predisposes to acidosis, while others are equally positive that ether is more likely to produce

[1] Read before the Knox County Medical Society, at Knoxville, Tennessee, June 15, 1911.

it. In this they may also be in error, since acidosis has been seen following the use of nitrous oxide.

These deductions may be accidental in view of the fact that the observers making the report were accustomed to using one or the other forms of anæsthetic.

A general anæsthetic may on the other hand precipitate an attack of acidosis in a patient in whom conditions are such as to favor imperfect oxidation of albuminous substances.

Again, it may be of interest to note than of the 46 cases at the Boston City Hospital, 17 showed symptoms on entrance; 12 twenty-four to forty-eight hours after anæsthesia, ether being used in 10 cases, and nitrous oxide in two cases. In 17 symptoms were not present at time of entrance, but developed later, no anæsthetic being administered.

This coincides with my experience in four cases. Two developed it after anæsthesia, ether being used. Two showed it neither of whom had taken an anæsthetic. One of the latter suffering from sepsis showed acidosis; but under a strictly milk diet, and large doses of bicarbonate of soda, the diacetic acid disappeared from the urine. She submitted to section and went on to recovery without again showing diacetic acid in the urine.

While acidosis has such a malignant influence on a patient's prospects of recovery and should cause us gravé concern, and especially warn us to give a guarded prognosis, every case that shows signs of acidosis is not necessarily fatal, as is evidenced in mild cases.

We have no observations to offer in regard to the minimum lethal dose of B-oxybutyric acid, and diacetic acid, as we could find no data upon which to base an opinion; but we do have well authenticated evidence of large quantities of oxybutyric acid being eliminated in diabetes, varying in amounts from 67 to 226 grams in 24 hours. As nothing was said as to the ultimate result of these findings, we take it for granted in such cases there was a mortality.

From these considerations then we are justified in concluding, should a patient present a certain symptom complex in association with any morbid process and more especially after operation, that even if positive proof is lacking in frank clinical signs, circumstantial evidence may and should warrant a suspicion of the condition under question, and admonish us to look for diacetic acid in the patient's urine.

Here then it seems to me is the time and place to make inquiry into the character of the body or bodies whose visits we observe with so much horror and dread.

The nature of this substance is most frequently found in the form of diacetic acid, and that is the body we should always look for in the tissues, but since it is a derivative of B-oxybutyric acid produced by oxidation we shall direct our attention to the latter.

B-oxybutyric acid may be regarded as a volatile, aromatic, organic non-nitrogenous acid of the glycolic series, which is a diatomic alcohol of the fatty group. In short a compound of olefine with two equivalents of hydroxyl: $(C_2H_6O_2 = C_2H_2\,O.H)_2$.

That it is in part derived from the amido-acids is shown by the fact glycolic acid does not exist in the body, but is a derivation of glycohol, formed by the substitution of a hydroxyl group for the amido group. The chief reason for the condition acidosis being so dangerous is the ingredient B-oxybutyric acid found in the blood; whose origin then may be epitomized by saying its immediate progenitor is a volatile fatty acid; which is an oxide of an aldehyde; which is an oxide of an olefine produced by oxidation; which is an isomeric hydrocarbon. It also has collateral branches in the alcohols and ethers.

Such in fine is the origin of B-oxybutyric acid.

It is not a normal constituent of urine, like one of its end products acetone, being found only under certain morbid conditions, and as a derivation of albuminous decomposition.

B-oxybutyric acid is oxidized into acetone and diacetic acid. Albeit acetone in small amounts is a normal constituent of urine and is inconsequential, in the pathological condition in question it appears in large amounts and is associated with diacetic acid, the chief malefactor par excellence. And it is this latter body with which we are chiefly concerned.

Now, as "every urine that contains B-

oxybutyric acid also contains diacetic acid, it will be also understood that diacetic acid may occur in urine in absence of B-oxybutyric acid, and this is more common," says Simon.

No observations have been adduced to show why certain patients at certain times and under certain circumstances should develop signs of this by-product in sufficient quantities to produce systemic reaction while others under like circumstances escape, unless as suggested by Simon in the latter class the end products of B-oxybutyric acid are oxydized beyond diacetic acid and acetone.

It is foreign to the scope of this paper to enter into a discussion of the methods of determining the presence or absence of diacetic acid in the tissues, that were better left to a consultation of any of the standard works on analytical chemistry; but we shall pass at once to a study of those signs that will enable us to recognize its presence early in its onset. The truth is the symptoms of this condition present a clinical picture so portentous as never to be forgotten.

The symptoms then vary within wide limits from an uncomfortable feeling with lassitude in mild cases, to great restlessness and wild delirium in fatal cases.

Between the two extremes are cases showing all the cardinal features of acidosis with various types that mimic conditions like hæmorrhage, and reaction from shock with delirium. In fact I have a suspicion some future observer may show reaction from shock with delirium is caused by acidosis.

While a composite picture of acidosis may be created by a grouping of a number of symptoms which collectively may be regarded as a concrete expression of this condition, it is a question if there is a single symptom pathognomonic of all types of acidosis.

The peculiar sweetish odor of the breath (likened by some to the odor of an apple, or chloroform, to me the smell of new mown hay) which some clinicians claim is present in all cases, I have failed to verify in mild cases.

I have noticed it in fatal cases, however, in point of truth it was the sign that first aroused my suspicion, in the first cases I observed. In such circumstances a laboratory examination will corroborate the clinical observation.

Another confirmatory sign of much importance (especially in a differential diagnosis of shock and hæmorrhage) is bright red appearance of the fingers and visible mucous membranes, which may be accounted for by the diminished alkalinity of the blood, upon which depends the power of absorbing CO_2 from the tissues. The venous blood has the appearance of arterial blood.

Futhermore, the entire body may be of this same pink hue. In one of my fatal cases such a condition happened; in the other the pink color was limited to the fingers and visible mucous membranes.

Another symptom of much importance noted by Kusmaul and quoted by Brewer which I have been able to confirm in fatal cases is that of air hunger, in other words, a typical Cheyne-Stokes respiration.

There is one symptom, distressing and of evil omen, all writers are agreed upon, which at first may be misleading as to the source, especially in a patient recovering from an anæsthetic, and that is nausea and vomiting.

The character of the vomitus varies from a clear to a dark color, at times mixed with a little bile, and it is quite copious. It may or it may not have an odor.

The kidneys. I have not observed that the function of the kidneys was reduced, in fact the opposite happened in my cases, the urine being secreted in considerable amounts and I fancy in larger quantities than sometimes happens after an anæsthetic.

A feature of this condition that struck me quite forcibly in postoperative fatal cases was the sudden onset of the attack when the patients apparently were doing splendidly, that is to say, the pulse, respiration, and temperature were a trifle above normal and the patient sleeping quietly, when suddenly without warning she would waken with a start, and begin making loud noises and toss about the bed. One patient sang incessantly till she died. I could not stop her nor could I get her to answer any questions.

The temperature, pulse, and respiration played queer tricks in my patients. Note the changes.

The temperature in one case in less than three hours ran from 99.2 to 104.4°; the pulse

from 102 to 160; the respiration from 22 to 39. This patient apparently died from cardiac failure.

In another case the temperature in a short time registered 104.4° the respiration 90; while the pulse would rise and fall (like a water gauge) from 100 to 132 and just before death registered 114. This patient died from respiratory failure.

Involuntary discharges and coma preceded death in both cases.

Treatment. Mild cases in my opinion will get well anyway. In grave cases treatment is of little avail. I have used purgatives, large quantities of bicarbonate of soda by the stomach, by hypodermoclysis, salt solution with calcium chlorid per enema, washing out the stomach, and intravenous infusion of normal salt solution with bicarbonate of soda. In the way of stimulants I have used digitalis, camphor, strychnine, adrenalin, and whisky, without appreciable benefit.

FIBROID TUMORS OF THE VAGINA

With Report of a Case

By A. H. BARKLEY, M. D., Lexington, Kentucky

THIS case is not reported so much for the character of growth removed as for the very unusual site of its location.

Perhaps of all growths occurring in the vagina that of fibroma is perhaps least often met with as is attested by the fact that out of ten communications from prominent gynecologists in this country only four report having met this condition and not one of the four have had more than one case.

The writer has found the literature very scanty and the text-books give it only a passing mention and in all instances stating that it is exceedingly rare.

Fibroid tumors of the vagina do not differ materially from the same tumor located elsewhere in the body except that in one instance they may contain more or less muscular tissue.

These tumors vary in size from a small nodule to the size of an orange or larger, they seldom give rise to trouble except when they attain such proportions as to produce weight and pressure symptoms and only then does the patient seek the services of a surgeon. They are usually located on the anterior wall and more rarely on the posterior. They are as a rule exposed to edema, ulceration, and gangrene, and in some instances have undergone malignant degeneration, and it is these possibilities as well as the inconvenience of having a tumor in this region that makes their removal highly desirable.

Mrs. R., white, age 35, had four children, was lacerated with the third child, no instruments were used in delivery of the children, examination of the pelvis showed a mild degree of endometritis, the other organs being normal. She first noticed a small nodule on the anterior wall of the vagina in December, 1906. This grew gradually until the weight caused such disturbance of her bladder that she came to me for relief. The tumor could be readily seen, causing the entire vaginal outlet to bulge markedly. The removal was accomplished without difficulty; the opening was closed with two rows of catgut sutures which united by first intention.

The tumor measured 2½ by 3¾ inches.

JOHN R. McDILL, M. D.

DEPARTMENT OF
NICHOLAS SENN FESTSCHRIFT

TROPICAL INFECTIONS OF THE DERIVATIVES OF THE PRIMITIVE GUT; THEIR COMPLICATIONS AND TREATMENT[1]

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THE specific causes of all known forms of dysentery are to be found in all climates. Manson has shown that great epidemics of dysentery have been confined to temperate latitudes, but ordinarily the disease is more endemic in the tropics and neighboring countries. The reason for this is generally conceded to unhygienic habits and conditions, impure water, deficient and improper diet.

The principal dread of foreigners contemplating residence in the tropics has always been and will long continue to be due to the fear of "tropical" dysentery and its complications. This fear has been justified by its deadly results in the past, but modern tropical researches have already robbed the disease of its terrors, and with the advent of pure drinking water, with better public understanding of the fact that the causes are taken in by the mouth, dysentery should no longer be regarded as a dangerous or even as a serious affection. The most striking proof of this passing of dysentery in Manila at least is that the liver abscess complication formerly so frequent is rarely encountered now, and then only in neglected cases.

STATISTICS OF DYSENTERY

Tabulation of the enormous material in the literature according to the custom of statisticians would be a waste of time and space and would prove almost nothing. The material available in the libraries of Manila, with some unpublished data we have collected from other far eastern countries, and from our own cases, refers to over one hundred thousand cases of dysentery which were complicated by four thousand cases of liver abscess. Seventy thousand of these cases were compiled in India.

A study of these statistics shows that the compiler, like many readers of the Bible, finds whatever he is looking for. Their value, like that of most

[1] Read at the February, 1911, meeting of the Philippine Islands Medical Association, Manila, P. I.

Plate A. Colon. Multiple areas of necrosis and beginning ulcerations in a case of beriberi complicated by smallpox.

statistics, is only relative because the way in which they are collected and recorded is unsatisfactory according to present day methods, and the personal equation is also everywhere too apparent. Dysentery, for example, is only diagnosed when there is flux; the amebic form only when amebas are found in the ordinary stools of patients with loose bowel movements, and nowhere is stated the technique of collecting the stools, the time of examination after being collected, and the number of cover glasses examined. We have long since found when repeated examinations for amebas were negative that a brisk saline cathartic will dislodge the parasites from their attachments to the mucosa and then numerous motile amebas can invariably be demonstrated in the watery portion of the stool whenever they are present in the bowel. We have also long since understood that severe amebic disease of the colon can exist not only without loose stools, but with constipation. Reports of liver abscess cases are not infrequent in which there is no history of dysentery, and many abscesses discovered at autopsy are recorded as showing no evidence in the bowel of either past or present dysentery. The great difference in statistics as to the frequency of amebas in the liver abscess itself is probably due to the fact that many observers were not aware that amebas in the free pus were accidental and that they grow on the ragged walls of the abscess cavity in the same manner as they develop on the ulcer base on the mucosa of the colon.

Plate B. Colon. Ulcerative amebiasis; severe.

The general parasitism of the intestines is not mentioned at all except by a few observers, notably by Sir R. Havelock Charles, Indian Medical Service (4), and the sources of the primary disease as well as the intestinal hygiene and the prophylaxis receive small notice.

Curiosities of the statistics. Exploration by repeated punctures through chest wall or abdominal wall, not at all dangerous; that collapse of the lung during an operation is not serious; that abscesses are always encapsulated with smooth lining surfaces; that if not opened they encapsulate and are absorbed; that adhesions to other organs are not the rule; that fish bones and straw are often found in the abscess; that postoperative biliary fistulas are usual; that the liver may be very freely searched by breaking it up with the fingers without danger of shock or hæmorrhage; that attempts to control hæmorrhage from a wound in the liver should not be made, as it is not a bad thing, and for the shock following severe bleeding transfusions should be employed; that according to some authors there is no reason for dysentery existing in the same world with ipecac and that this drug will even abolish an established abscess of the liver, etc.

The numerous and valuable contributions to this subject and their generally accepted opinions are founded mostly on theory, practice, and postmortem revelations, but if we study the disease from the standpoint of modern parasitology, embryology, experimental surgical physiology, living pathology, conservation of the natural immunity of the patient,

Plate C. Colon. Amebiasis showing gangrene of mucosa.

anatomy, modern treatment of intestinal amebiasis in particular, intestinal mycosis and parasitism in general, and modern operating room results, these conditions should be more clearly understood and their treatment be put on a more accurate and sounder physiologic basis.

EMBRYOLOGY, PHYSIOLOGY, AND ANATOMY

The small intestine begins at the pylorus and the large gut at the cecum, but functionally they maintain the rudimentary type, the small intestine beginning in the duodenum just below the common duct and the large intestine near the splenic flexure of the colon. From the embryologic foregut we get the back wall of the pharynx, esophagus, and stomach to the third portion of the duodenum, the liver and pancreas being developed from the duodenal end. The gall-bladder and common duct are direct invaginations of duodenal structures (Cuningham). All these organs having their origin in the foregut prepare food for digestion, but are not capable of absorption except for certain things, like stimulants.

The jejunum and ileum absorb ninety per cent of the proteids and take up solid foods, but do not dispose of much of the fluids. The contents of the ileum at the ileocecal valve are still liquid, having lost the bulk of their nutritive elements and the cecum absorbs the fluids and drives the waste solids further along. Thus the midgut retains its primitive characteristics. Man prepares his food with the organs which have their origin in the foregut and absorbs his nutrition from the derivatives of the midgut, that is, as Mayo says, he eats with his jejunum and drinks with his cecum.

The liver, the most massive, most friable, most vascular, and the most interesting of the glandular organs of vertebrates, is moulded to the arch of

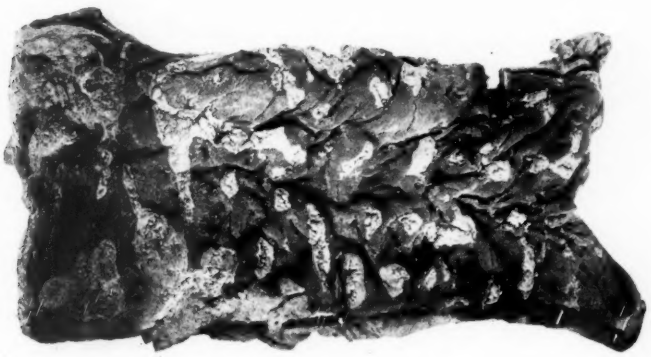


Plate D. Colon. Multiple areas of necrosis in acute amebiasis.

the diaphragm in man, supported there by its ligaments and the vena cava and overlapped by the lung and by the bony thorax; below it is supported by intra-abdominal pressure and moulded by the organs which mark its under surface with the kidney, colon, stomach, and duodenal impressions; although it rises and falls with respiration, and fluctuates in size both in health and disease it is for clinical purposes to be regarded as a fixed organ. It is distinguished by having two vascular systems, a nutritive and a functional; the main trunks of both circulations are included in one pedicle together with the common bile duct. The surgical importance of this is that with one finger behind this pedicle in the foramen of Winslow all blood movement in the liver can be controlled by digital compression.

The arterial blood supply through the hepatic artery is nutritive only and the functional or portal supply is normally a low pressure circulation and begins and ends in a capillary system; that its veins possess no valves, are adherent to the liver substance and lack contractible tissue is of great clinical importance. At the transverse fissure of the liver the portal vein divides into a right and left branch, the right being the direct continuation of the main channel in which the blood current is swifter and by which septic materials and emboli from a diseased intestine find their lodgment usually in the right lobe. The accessory portal systems (2) must also be borne in mind by the clinical surgeon. They form a communication between the portal and systemic venous systems, and are found in the peritoneal folds which unite the liver to the abdominal wall and diaphragm; they are normally small and unimportant, but when the intravenous pressure is raised in the portal vein by an obstruction, they enlarge and establish

Plate E. Colon. Multiple ulcerations in severe chronic amebiasis.

a collateral circulation; (a) between the superior hemorrhoidal vein and the branches of the middle and inferior hemorrhoidal veins; (b) between the portal vein and the superficial veins of the abdominal wall; (c) between the branches of the gastric and the esophageal vein. The nerves of the liver are from three sources: the left pneumogastric nerve, the left phrenic nerve, and the sympathetic nerve from the solar plexus; the latter developed from mesoblastic tissue, is undoubtedly the primitive nerve, because it has retained to a large extent its primitive control as far as digestion and the maintenance of the body is concerned. The essential difference of clinical importance between the sympathetic and the cerebrospinal system is that it is not segmented and is therefore unable to prevent general or special functional disturbances upon irritation of any of its component parts. Pain over or under the right shoulder from the liver is reflected along the right phrenic nerve to the fourth cervical nerve and thence to the supra-acromial nerve.

Surgical physiology. The liver plays a heavy rôle in the animal economy. Aside from its exceptional size, the one striking fact is the tremendous venous blood stream from the gastro-intestinal canal flowing through the vena porta and the distinctive blood-vessel arrangement in the liver itself. Each single lobule is flooded by the blood of the plexiform capillary network from within and from without, whereby the blood comes into most intimate relations with each cell and the blood stream at the same time experiences a sea-like spreading out.

Only a most superficial conception of the true physiologic significance of

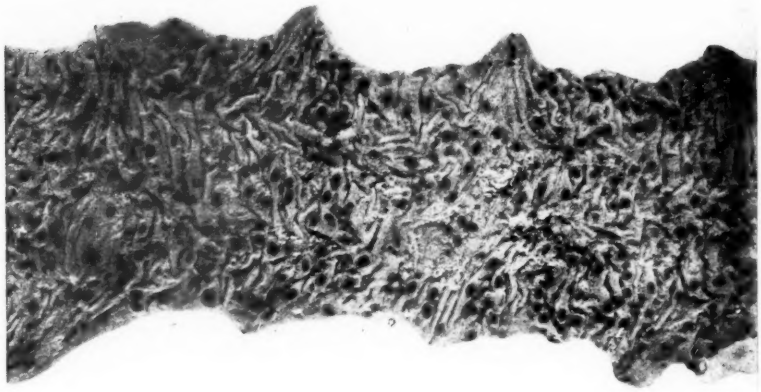


Plate F. Colon. From case of smallpox.

the liver as an intricate mechanism can be understood from the many wonderful known and unknown chemical processes going on in its laboratories.

The peculiarity of the gland in receiving poisons by the portal vein without resulting damage is most impressive. It disposes of the daily physiologic products of the gut from digestion and secretions, as well as the septic and toxic substances in health and disease which latter products it either transforms into harmless compounds or combines them with various substances to rob them of dangerous properties, or they are held fast in the liver till disintegrated or diluted and removed by the circulating blood. The most striking experiment demonstrating this property is the one by Munk who showed that soaps put in the jugular vein are exceedingly poisonous to the heart, but injected into the portal vein, they almost entirely lose their injurious effect by passing through the liver. Alkaloids and mineral poisons, it has long been observed, can be given by mouth in doses which would be fatal hypodermatically, and the interesting question — what influence on the structure and function of the liver various poisons, ferments, and stains which are retained in the liver, have, is not fully answered (3), although it is well known that fatty degenerations, fatty infiltrations, interstitial inflammation and other complex liver changes follow a long list of deleterious substances as well as the infectious diseases.

Interpretation of clinical signs and symptoms and the treatment of liver infections is materially aided by taking into consideration the extensive relationship of the organ to other derivatives of the primitive gut, its won-

Plate G. Balantidium coli infection. (Bowman.)

derful function, fixed position, great friability, great vascularity, and variation in blood pressure.

The colon is about five feet in length, is more fixed than the small intestine, because it is not so completely covered with peritoneum and its veins are all of the portal system. The capacity of the colon of an infant five months old is 500 cc. (one pint); of a child two or three years old, 1000 to 1500 cc. (two or three pints); and of an adult, 4500 cc. (nine pints). The capacity should be borne in mind when irrigating the colon.

The appendix is the undeveloped distal portion of the primitive cecum. The preponderance of lymphoid tissue is a special characteristic of the appendix and explains its susceptibility to inflammations. It has defective drainage, defective structure, and defective blood supply.

ETIOLOGY

The organs concerned in the development of dysentery and its complications are all derived from the three primary embryologic divisions of the alimentary canal; this and a consideration of the pathology of the primitive functions of the organs of digestion which persist after embryologic form has disappeared (1) point to more than the possibility of an etiologic relationship between the stomach, duodenum, pancreas, liver, colon, and the appendix, in explaining some hitherto obscure clinical phenomena both of liver abscess and of intestinal parasitism.

Plate H. Liver. Upper surface showing innumerable minute multiple foci of secondary infection from amebiasis of the colon.

Plate I. Liver. Cut surface of same specimen as Plate H.

Strong (6) states that now owing to tropic researches we may distinguish, from an etiologic standpoint at least, seven different parasitic infections which give rise to dysenteric symptoms: amebic, malarial, balantidial, kalaazar (not yet found in the Philippine Islands), schistosomal, bacillary, esophagostomal (not yet found in man in the Philippine Islands), and recently Bowman has reported three cases of balantidium coli infection causing dysentery and death. Many forms of verminous disturbance of the intestinal functions remain to be described. Statistical studies of the evidence of intestinal worms among Filipinos although so far based mostly on but one cover slip preparation with no preliminary catharsis, nevertheless show that such intestinal parasites as ascaris, trichuris, hookworm, oxyuris, tenia, hymenlepsis, and strongyloides, are so common that at least one hundred per cent of Filipinos harbor one or more species of these intestinal worms. Willets states that there are very few single infections per one hundred persons and that 1.85 infections per person seem to be a fair estimate of intestinal helminthiasis among Filipinos. These estimates are based on the examinations of Garrison, Rissler, Chamberlain,

Willets, Llamas, Leynés, and Gomez, of 19,302 Filipinos from every part of the Islands. To this may be added the examinations of the stools of over 6,000 Filipinos in St. Paul's Hospital, from 1905 to 1910, which showed about 1.50 infections per person. Lartigau has shown that bowel parasites and their products, and bowel bacteria are carried to the liver by the portal system and that on their way back to the bowel they excite not only disturbance of hepatic structure and function but cause various infections of the bile tract and mucosa, the gut again suffers by receiving the secretion of a damaged liver and a pathologic vicious circle is established. We now know that they also cause profound reflex disturbance of function in the gastro-duodeno-hepatico-pancreatic physiological system secondarily by acting as irritants in the large bowel, just as irritation of the appendix by chronic inflammation reflexly causes gastric and duodenal disturbance, which in turn interfere with the mechanism of secretion, storage, and outflow of digestive secretions and of bile, thereby producing conditions favorable for bacterial infection in these organs and in the gall-bladder (MacCarty).

The amebic form of dysentery which is primarily limited to the colon, still receives most of the attention of investigators. The great works, principally of Musgrave and Clegg, extending over a period of many years, on the study of amebas and amebic disease has had a profound influence on this subject, but the rapid development since their investigations of the science of parasitology has resulted in recent announcements by observers such as E. L. Walker (7) and E. R. Whitmore, U. S. Army Medical Corps (8) that there is probably one pathogenic ameba which is a true parasite. Dr. E. L. Walker has consented to the statement that he has evidence that there is a pathogenic ameba microscopically distinguishable from other forms which is a true parasite and which does not multiply outside of the body. He has been unable so far to cultivate it. It is no doubt transmitted the same as any other parasite, by water, uncooked foods, and directly to the mouth.

Sellards (10) of the Biologic Laboratory of the Bureau of Science, Manila, has shown experimentally that immune sera can be produced by the injection into animals of cultures of amebas growing upon agar. The resulting sera are specific for the corresponding strains of amebas which produced them, thereby permitting the differentiation of amebas by their immunity reactions. Immunity reactions, analogous to those produced experimentally, could not be obtained with sera from cases of amebic dysentery, indicating either that immune bodies do not form during the course of a natural infection or that the cultures of amebas obtained upon agar were non-pathogenic.

Sellards working with cultures of amebas secured immunity reactions, with species that he could cultivate, that correspond exactly with Walker's morphological distinctions.

J

K

Plate J. Liver. Upper surface showing multiple superficial abscesses secondary to amebiasis of the colon.

Plate K. Liver. Section of right lobe showing deep and superficial abscesses from amebiasis of the colon.

Bacillary dysentery, caused by groups of closely related bacilli, is sporadic and far less frequent in the Philippines than formerly. The accepted etiologic organism seems to be the Shiga bacillus and the Flexner bacillus associated with the bacillus coli, which occur throughout the intestine but principally in the lower bowel. The onset may be sudden although a premonitory period of gastro-intestinal disturbance of one or two days is not uncommon; griping, tenesmus, fever, and diarrhœa until blood and mucus form the entire discharges and a continued desire to defecate. The most severe cases have resulted fatally within four days from gangrene of the colon, and mild forms often recover on the third or fourth day while still in the mucous stage. The surgical complications are few compared with amebic dysentery. Allbutt and Rolleston mention arthritis of the large joints as a rather frequent sequel; general sepsis and even pyemia, with parotitis, diffuse abscess, or peritonitis are also occasionally met with. The liver in the majority of severe cases shows more or less evidence of hepatitis with congestion but abscess formation is very rare. Paralysis of the lower extremities, of the sphincter ani or of the bladder, hemorrhoids, prolapsus ani, cystitis, nephritis and especially gastro-duodeno-hepatico-pancreatic disorders are most common.

SYMPTOMS AND THEIR RELATION TO THE PATHOLOGY OF THE PRIMITIVE FUNCTIONS

The sympathetic nerve seems to be the controlling factor in digestion and being developed from mesoblastic tissue is undoubtedly the primitive one and it has retained to a large extent its primitive control which has to do

Plate L. Liver. Section of right lobe with multiple abscesses, showing beginning coalescence of three central abscesses.

with the maintenance of the body. The one essential difference between this nerve and the cerebrospinal system is that it is not segmented and is therefore unable to prevent regional disturbances upon irritation of any of its component parts. This accounts for misleading symptoms in the upper abdomen especially those referable to the stomach such as pyloric spasm, atonic dilatation, prolapse, and gastric neuroses because they are reflex disturbances of function, the actual organic lesion being lower down — in the colon for instance.

It is certain that control of the pyloric sphincter is vested not only in the stomach and duodenum but also in all of the deviations of the midgut including the cecum and the appendix, and pyloric spasm often means nature's attempt to prevent food entering the irritated intestinal tract below.

Most observers have noted marked gastric and general digestive disturbance with complete loss of appetite and great physical weakness as a rather constant prodrome as well as the most prominent symptom of tropical dysenteric disease and in those cases that failed to develop a flux, or even in those that developed an irregular diarrhœa, the possibility of an etiologic

Plate M. Liver. Under surface showing multiple superficial amebic abscesses.

relationship between the primary infection in the colon, in which abdominal pain and tenesmus may be entirely absent, and the pathologic conditions in the digestive organs were often entirely lost sight of. The majority of cases are treated a long time for reflex gastric symptoms. Every practitioner should now recognize that the stomach reflects the disturbances from many sources of both the conscious and subconscious nervous system. C. H. Mayo states that to such an extent is this true that approximately only one individual in ten who complains of apparent serious stomach trouble ever has any real lesion of this organ.

The liver at times becomes congested, edematous, and swollen, in the course of chronic parasitic infections of the colon, a moderate hypertrophic cirrhosis is developed, back pressure in the portal system ensues, aggravating the primary colonic disease and the patient has "tropical liver" which some observers claim is a disease entity. That beneficial effect does not follow this pathologic venous hyperemia after Bier is perhaps due to the vitiated condition of the portal blood during intestinal disease.

Treated symptomatically, these undiagnosed patients furnish some of the incurable or intractable class of cases that are usually sent home as a last resort for a change of climate on the dictum that they can not live in the

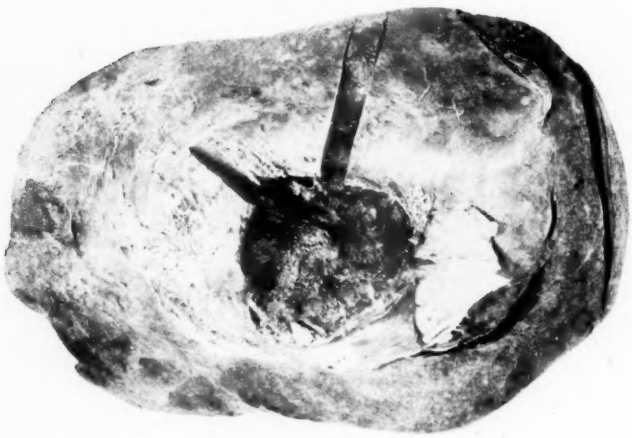


Plate N. Liver. Solitary superficial amebic abscess, outer surface, right lobe.

tropics, and when they die they afford examples of what Niemeyer calls "mortifying postmortem disclosures," in that the whole of the colon may be found thickened and riddled with ulcers undermining the mucosa, with only here and there islands of intact mucous membrane, and the immediate cause of death may have been intestinal gangrene, perforation, and peritonitis, or abscesses of the liver, all entirely unsuspected during life. The majority of dysentery cases have frequent, bloody, and mucoid stools at the outset especially in the amebic variety, but when the disease is well established their main characteristic is fluidity. From six to twelve yellowish-gray liquid stools containing mucus and occasionally blood are passed daily for weeks. Abscess of the liver is the most formidible complication, relapses are frequent, there is a constant tendency to chronicity, and a fatal issue is due either to the initial gravity of the lesions, to exhaustion in prolonged cases, or to involvement of the liver (Osler).

It has been noted by many tropic observers, but no explanation offered other than that of increased general sepsis, that the primary intestinal disease is often aggravated by a liver abscess complication, and several have reported as a curious fact that severe and even fatal hæmorrhage from the bowel has occurred in intestinal amebiasis only when complicated by liver abscess. This bleeding is probably venous, due to portal obstruction from acute hepatitis, and to some disturbance of the blood coagulant. Return of severe gastric and upper abdominal symptoms in the course of the disease with pain, tenderness, and rigidity over the cecal or the

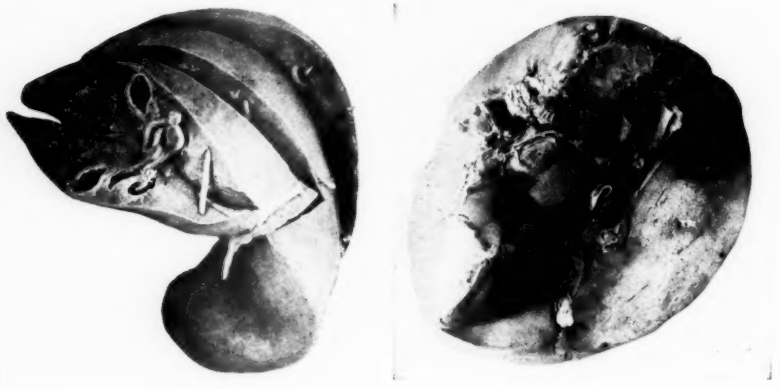
O O-a

Plate O. Case 1. Liver. Round worm invasion of liver through large common duct, showing small abscesses. Case of Dr. Vernon L. Andrews; not reported.

Plate O-a. Case 1. Liver. Round worm invasion through large common duct, showing small abscess. Case of Dr. Vernon L. Andrews; not reported.

appendical region we have frequently noted, and often curative enemas have to be suspended or abandoned altogether on account of the reflex effect on the stomach.

The general practitioner should make more use of the light of our present knowledge of the etiologic rôle of intestinal parasites; that embryology teaches us that stomach, duodenum, liver, gall-bladder, and pancreas are developed from a small segment of the primitive alimentary tract; that the parenchyma of these organs as well as the stroma, nerves, lymph, and blood vessels are derived from these structures in the primitive digestion tract; that anatomy reveals the same blood and the same nerve supply for these organs that existed when they were a part of the simple primitive tube; that physiology demonstrated the remaining necessity for the products of digestion to pass in contact with the same alimentary cells (now the liver and the pancreas) with which they came in contact in the primitive individual; and autopsy has shown that duodenal ulcers at or near the papilla of Vater are sometimes, if not always, associated with cholecystitis, and occasionally with chronic interstitial hepatitis (cirrhosis), MacCarty. Admitting, as we now must, the multiplicity of etiologic factors, especially in the tropics, the bringing together these undigested clinical symptoms and correlating them with the now well known embryologic, anatomic, and physiologic relations of the digestive organs will explain many hitherto mis-



P P-a

Plate P. Case 2. Liver. Round worm invasion through large common duct, showing small abscesses. Case 2 of Dr. Vernon L. Andrews; not reported.

Plate P-a. Case 2. Liver. Round worm invasion through large common duct, showing small abscesses. Case 2 of Dr. Vernon L. Andrews; not reported.

understood symptoms and should point the way to a more effective prophylaxis and to a more promising therapy.

Liver and other complications. Considering the enormous number of fatal dysentery cases with no record of the intestinal parasitism that are not autopsied, the impossibility of estimating the etiologic factors and the ratio of amebic liver abscess and other complications to the primary disease is apparent. *All* of the statistics *do* prove, however, that the native races of the tropics suffer from dysentery, liver abscess, and hepatic disease, in the proportion of about one to twenty of the white or European races in the tropics. The British argument to prove "tropical liver" an entity among white residents of the tropics has been cleverly built up, but can be disputed, although the truth of the hypothesis that age-long habituation of the native bowel to chronic parasitism ensures some immunity, can not be doubted.

Statistics seem to show that about 95 per cent of abscess cases occur in the right lobe (71 per cent, Roux); that the duration may be weeks or months; that alcohol, overeating, and too little exercise or too violent exercise are factors; that leucocytosis is almost always present; that increase in the polynuclears is of prognostic value; that some cases develop insidiously without symptoms; that the mortality is high in late or well advanced cases, especially in the very acute variety; that multiple cases are usually hopeless; that most of the cases were not operated until the abscess was visibly bulging or far advanced; that the solitary abscess is often a confluence of several; that all are due to amebas usually growing in symbiosis

Plate P-b. Case 2. Liver. Round worm invasion through large common duct, showing small abscesses. Case 2 of Dr. Vernon L. Andrews; not reported.

with other intestinal organisms, and that the general intestinal mycosis and chronic parasitism of the colon so common in tropic countries predispose to the disease.

Infrequent complications of intestinal amebiasis. The colon may be perforated and small circumscribed amebic abscesses may form at any part of its extent. The most frequent location of pericolonic abscess is about the cecum and such probably originates from the appendix. Amebic ulcers are not uncommon in the rectum and sigmoid and perforation of the walls results in ischio-rectal abscess in which amebas are found. Rare forms of abscesses containing amebas have been reported in the parotid gland, the brain, and the mouth. In 1904 I reported one case (11) of amebic infection of the urinary bladder without rectovesical fistula, in which the infection was evidently produced by an unclean catheter. Data of six other cases occurring in the military hospitals of Manila were promised but could not be procured. In 1906 I had a case of suspected liver abscess complicating intestinal amebiasis in an American negro, his cutaneous surface generally erupted in small indolent pustules, all of which contained motile amebas, and Musgrave and Clegg, who reported the case, also found amebas in the circulating blood. The appendix does not seem to play the expected rôle during intestinal amebiasis, but many of our cases of chronic appendicitis date from an amebic dysentery, and it has long been

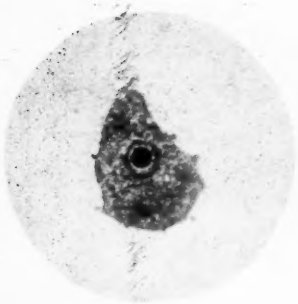


Fig. 1.

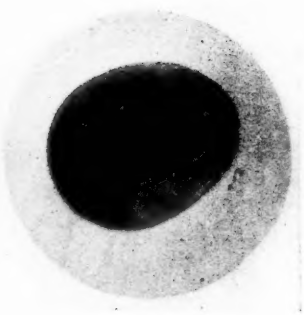


Fig. 3.

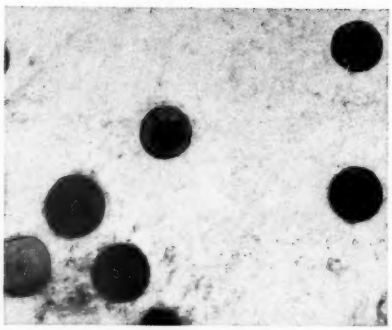


Fig. 2.

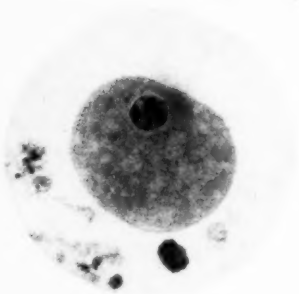


Fig. 4.

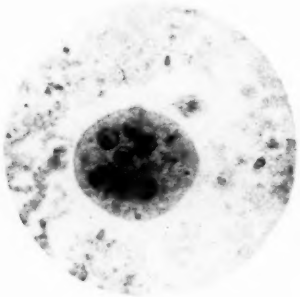


Fig. 5.

Figs. 1 and 2. Non-pathogenic and non-parasitic type of ameba found in Manila water supply and cultivated from intestinal tract of man.[1] 1, vegetative stage. 2, encysted stage.

Figs. 3, 4 and 5. Parasitic but non-pathogenic entamebas found in the stools of healthy persons. 3, entameba coli, Schaudinn. 4, entameba coli, variety Niponica. 5, entameba coli, 8-nuclear cyst; only five of the nuclei show in the optical section.

[1] The figures of amebas are reproductions from the original plates of Dr. E. L. Walker's article which will appear in the Medical Division of the Philippine Journal of Science for August, 1911.

suspected that latency in such appendices was perhaps responsible for recurrent attacks of amebic colitis, and also perhaps might explain the liver abscess that occurs without discoverable lesion of the bowel, and without a recent history of dysentery, the so-called primary infection of the liver. The gross appearance of some of these appendices is a peritoneal redness from vascular injection, with a similar zone spreading from the base of the appendix over the surface of the cecum. In spite of the utmost care all good specimens of these appendices were unfortunately ruined for microscopical examination for parasites.

DIAGNOSIS AND TREATMENT

Morris, in his "Fourth Era in Surgery," correctly admits that the science of the internist is getting so comprehensive that it is now better than that of the surgeon, in that it conserves the natural immunity of the patient, and the surgeon as well as the physician has learned not to sacrifice this immunity, by not doing more things to the patient, but by leaving him in condition to take care of his poisons himself by fighting it out in the battle between the phagocytes, opsonins, and antibodies against bacteria, parasites, and their products. The surgeon's function is to step in at the right time to turn the tide of battle and help put the enemy on the run. This would be the fourth or physiologic era of surgery which regards the patient as a factory, the business of which is the manufacture of opsonins for disabling bacteria and of phagocytes for destroying them, and the new idea is to stop disturbing this factory with surgical or other therapeutic methods which interfere with its output. The modern treatment of the ordinary dysenteric case is sound except perhaps in the matter of feeding and of thereby conserving the immunity of the patient. Whenever the digestive organs will perform their functions they should be taxed to their utmost with digestible and nourishing foods. Without the baptism of rich and healthy blood there can be no remission of the physical sins (James Adams Allen).

The first indication in the treatment of all dysenteries is to make an accurate diagnosis of the protozoal and verminous factors by examination of the watery stools after administration of a saline cathartic. When ulcers of the rectum or sigmoid are present a most satisfactory method of diagnosis is the examination of a smear made from a scraping or swabbing of the ulcer. This will indicate what disturbs the sympathetic nervous centers by ringing up the central stations of the sympathetic ganglia, and the second indication is to remove the definite removable causes for the disturbance. The cases that should come to the surgeon are the intractable ones and their coming should not be too long delayed. Walker, of the Research Laboratory of the Bureau of Science, Manila, states that he has been able to distinguish strict or obligatory parasitic entamebas from the ordinary free-living or non-parasitic amebas. Among the parasitic entamebas, moreover, he is able to distinguish one non-

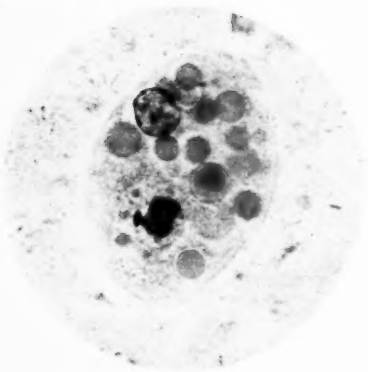
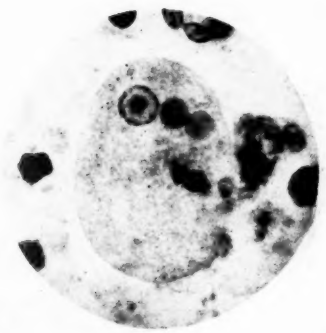


Fig. 6.



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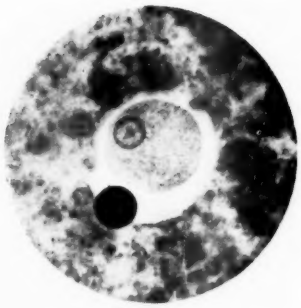

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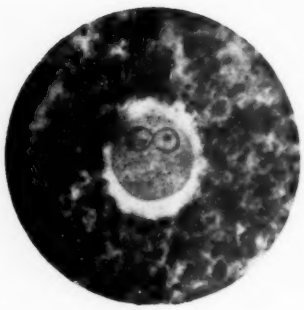

Fig. 9.

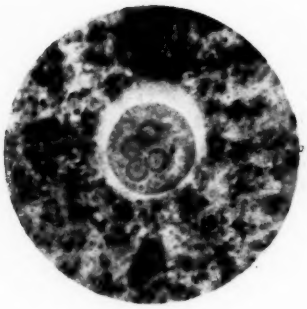

Fig. 10.

Figs. 6 and 7. Pathogenic and parasitic entamebas found in dysenteric stools. 6, entameba histolytica, Schaudinn. 7, entameba histolytica, variety tetrangina.

Figs. 8, 9 and 10. Encystment of pathogenic entameba histolytica. 8, 1-nuclear stage preparatory to encystment. 9, 2-nuclear stage. 10, 4-nuclear stage, mature cyst.

Encystment of the pathogenic amebas occurs only during recovery from the disease and with hardening of the stools; the encysted amebas are carriers and have been found in large quantities in hardened stools six months after the patient has recovered.

pathogenic species that includes the entameba coli of Schaudinn and the entameba Niponica of Koidzumi, and one presumably pathogenic species which includes entameba histolytica of Schaudinn and entameba tetragina of Viereck and Hartmann. (See figures 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.) When the disease repeatedly relapses or does not yield to ordinary treatment and the patient's resistance is getting less and less and the colon will perhaps no longer tolerate irrigations and ipecac has failed, it is time to establish a temporary opening into the cecum through which the large gut can be treated at will.

Diagnosis and treatment of liver abscess (9). When the intestinal disease is very active and ulcerating, there often occurs an acute parenchymatous, cloudy swelling of the entire liver, creating the general *locus minoris resistentiæ*. A septic ameba-laden embolus from a septic thrombophlebitis of the ulcerated colon, of sufficient size to block a portal capillary in such a liver, is probably the beginning of an abscess or of a necrosis. Wonder is that abscesses are not more frequent, because amebas and other bacteria reach the liver through the portal blood stream more or less constantly during an intestinal infection.

Abscesses of the liver vary in size and number from the solitary one, in over 60 per cent of the cases, which may even occupy the entire right lobe, to the multiple, disseminated ones occurring in tens or hundreds and varying in size from a pinhead upward. The cases coming to operation have usually been either single or at most two or three in number which coalesced by increase in size. The right lobe is involved in about 95 per cent of the cases and is usually the only part affected. The favorite location in this lobe is its upper and outer segment.

In fatal, untreated cases the patients die, without perforation, from sepsis due to mixed bacterial infection which, in turn, hastens the end by aggravating the primary intestinal disease. Perforation into the peritoneal cavity and fatal peritonitis is a common termination. Spontaneous cure commonly follows perforation into the right pleura or lung. A subphrenic or subdiaphragmatic abscess which almost always originates in the liver may open externally anteriorly, and it is possible for cure to follow perforation into the stomach, colon, or other hollow viscus, but it is very rare. Sterile abscesses or abscesses with a mild bacterial admixture may exist a long time without symptoms.

Symptoms and diagnosis of liver abscess. In most cases the clinical picture with a few of the symptoms lead the experienced physician to an early diagnosis, although large symptomless abscesses have been overlooked entirely by the best of observers. Fever is usually present, but not characteristic; daily or irregular rigors with rise of temperature and perspiration is very suggestive, but cases have been known to run an afebrile course. As an abscess enlarges or approaches the surface of the liver, pain appears and is rarely severe. The pain so often complained of in the shoulder is generally found

Fig. 11. Curvilinear incision to expose 9th and 10th ribs.

Fig. 12. Resection of four inches of 10th rib; resulting gutter to be closed immediately by catgut suture.

more exactly beneath the right clavicle. When the liver is swollen, pressure beneath the costal arch and over the lower right intercostal spaces is usually painful. Sitting, standing, or lying on the left side sometimes produces pain. The patient is most comfortable on the back.

Leucocytosis in rapidly developing abscesses is a constant condition and an important diagnostic aid. The primary intestinal disease, which is generally worse during a liver abscess, may alone be responsible for a persistent leucocyte count of 15,000 to 20,000, but this factor can be eliminated to a great extent by colonic irrigations and saline laxatives. A persistent and

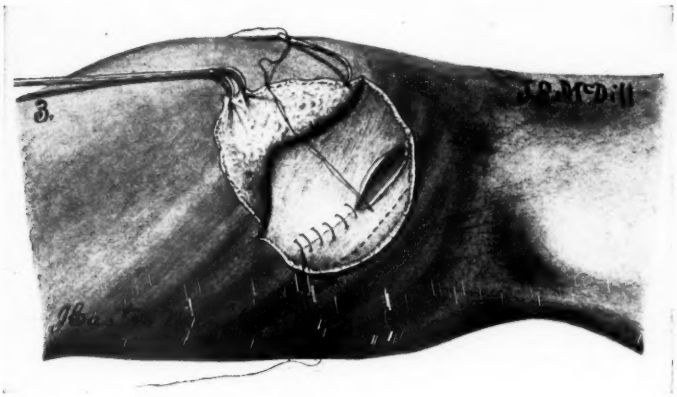

Fig. 13. Cavity or gutter left by rib resection, partly sutured; dotted line below indicates the next incision which is close to the upper border of the 11th rib and extends into the peritoneal cavity through all layers of chest wall and diaphragm.

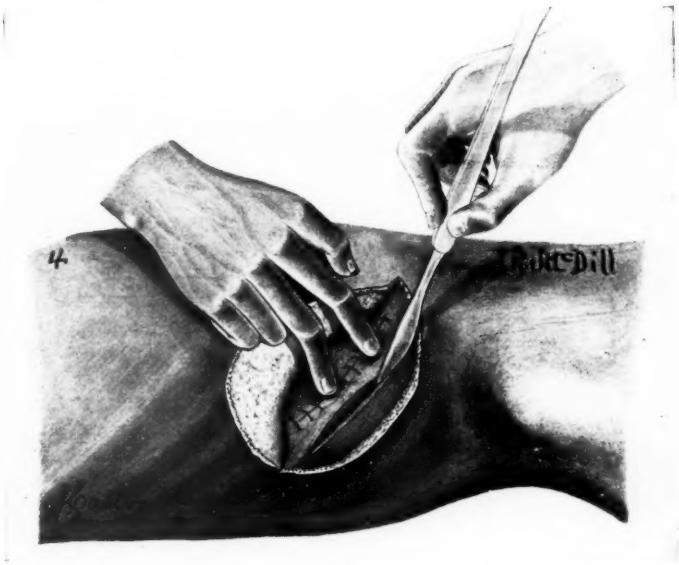

Fig. 14. While incision into the peritoneal cavity is being made the mobilized chest wall is held firmly against the diaphragm by two fingers of an assistant; this should prevent entrance of air into the pleural cavity until the cut edges of chest wall and diaphragm can be clamped together and then sutured, making air tight closure of the pleural cavity.

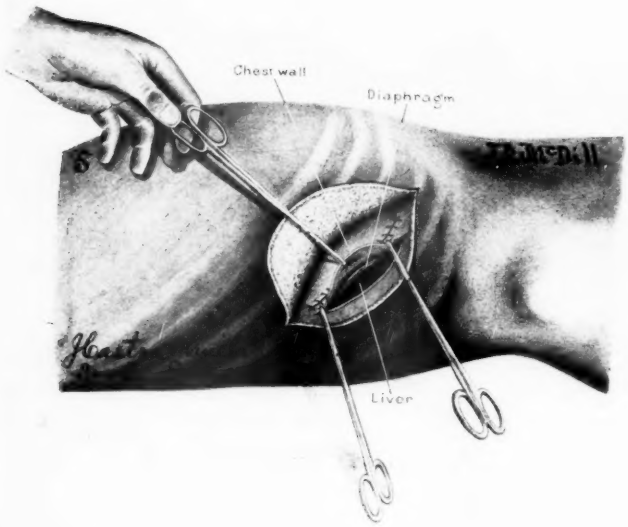

Fig. 15. For demonstration only; the edges of chest wall and diaphragm, which are to be united by suture, are held apart.

increasing high afternoon count without many other symptoms has come to be regarded as the most positive indicator of pus, because the white count drops to near normal about 48 hours after drainage.

Physical signs. The liver enlarges and can readily be palpated beneath the costal arch, and the area of dullness upward shows the extent of the swelling. The fact that the enlargement is often more upward than downward (Osler) is due to the dome of the liver being the favorite site of abscess formation. In old and indolent abscesses no swelling may be demonstrable. Fluctuation, of course, can never be detected.

General symptoms. Jaundice and stomach symptoms are not constant, but a dry, grunting, irritating cough with thoracic respiration usually means that the diaphragm is involved and that perforation into the lung is imminent, and even immediate drainage does not always prevent its occurrence. Another rare symptom is fatal intestinal hæmorrhage, which is never observed in dysentery except when complicated by hepatic abscess.

Diagnosis is not difficult in marked cases, but symptoms fail and vary so greatly in some that the diagnosis is long in doubt. We then depend more on the general appearance of the patient and the clinical picture for a provisional diagnosis, and if the condition is not very serious observation is

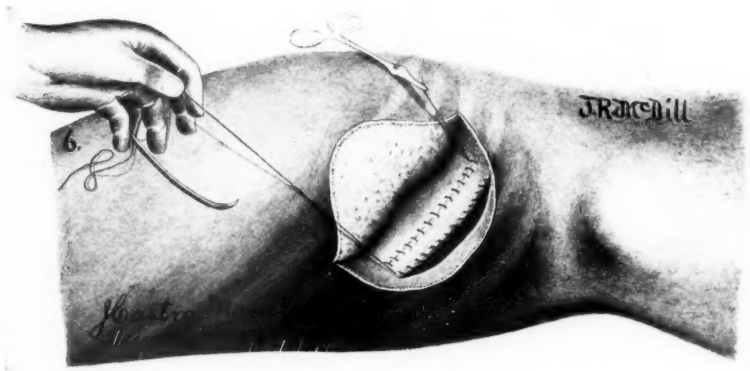

Fig. 16. Suture of chest wall and diaphragm completed, showing exposure of liver.

Fig. 17. Drain in place, gauze ring around tube to prevent sciling of peritoneum and to orm adhesions.

extended another week or two, by which time a diagnosis can usually be made positive. Exploration with a hollow needle and syringe through the abdominal wall or across the pleural cavity is dangerous. If such a procedure is decided on, preparation for operation should be made, and if pus is located immediate incision before withdrawing the needle is the only safe plan.

Fig. 18. Mikulicz pack to procure adhesions, after failure to find an abscess; through the adhesions explorations with cocain daily, if necessary, can be made till pus is found.

The best way to examine a liver for pus is to expose sufficient of its surface to allow of deliberate and efficient exploration, both digital and by needle. If pus is not found, pack the wound wide open and explore again every two or three days after adhesions have formed.

OPERATION FOR LIVER ABSCESS BY DIRECT INCISION AND DRAINAGE

The abdominal route. When the liver dullness extends well below the costal margins and especially when the organ bulges anteriorly as it sometimes does in neglected cases, the abdominal route, preferably through the right rectus muscle, if viscero-parietal adhesions are encountered, amounts to nothing more than a simple oncotomy. If adhesions are limited and recent, or absent, the abscess cavity if accessible should be opened through a ring of gauze, packed between the liver and the abdominal wall, either immediately or after 48 hours according to the two stage principle. The gauze ring may be fastened to the parietal peritoneum at two or three points by stitches of No. 1 gut; it is unnecessary and unsatisfactory to attempt to sew it to the liver. The liver is ordinarily not surgically accessible through the abdominal wall except for its under surface, the left lobe, and a portion of the right anterior margin.

The transpleural route. A subpleural route is described by many surgeons, but normally all cartilages and ribs are covered with pleura except for six centimeters (2.4 inches) on the twelfth rib and this varies so often that so-called subpleural operations to expose the right lobe succeed only when some pathologic condition obliterating the lower angle of the pleural cavity or some anatomic anomaly of the pleural sac itself is present. It is not practicable to freely reflect upwards by dissection the parietal and the

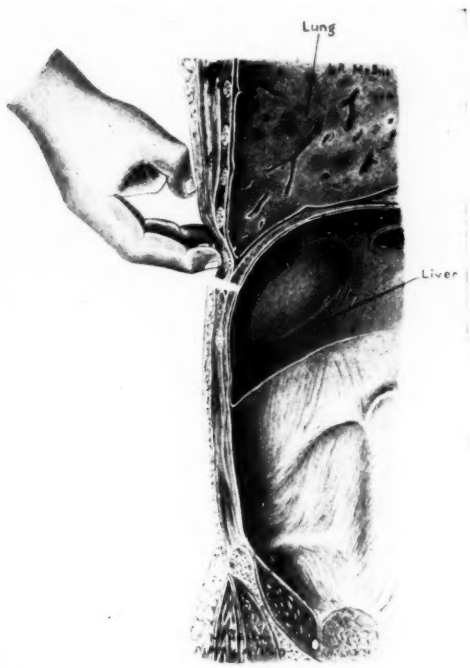

Fig. 19. Diagrammatic sketch showing layers incised and digital method of temporarily preventing pneumothorax till diaphragm and chest wall are sutured.

diaphragmatic pleura during an operation without tearing them and producing a pneumothorax; there is not enough to this delicate membrane to permit of this being done successfully unless by anatomic dissections on the cadaver. Some authors even instruct us to suture a rent in the pleura immediately, as if it were a structure that admitted of suturing. Any one who has heard and felt the sudden blasts of air rushing in and out during the occurrence of pneumothorax due to a rapidly widening opening into the pleural cavity and has attempted to find and close the hole can not understand such advice.

A transpleural operation to attack a liver abscess before it has developed to an extreme stage and before the liver swelling is evident on inspection gives the best access to the entire right lobe, in which 95 per cent of abscesses are found. This exposure of the liver surface is not affected except favorably by the great reduction in size that occurs within twenty-four

Plate Q. Special instruments for transpleural operations to the liver. A, Rib shears. B, Bone forceps. C, Cranial chisel for separating periosteum from rib margins. D, Periosteotome. E, Exploring syringe. F, Kelly vaginal speculum through which a bleeding cavity is packed. G, Packer. H, Combination drain and condon hemostat slightly inflated.

hours after needling a swollen liver and through it the organ can be explored daily for weeks if necessary with the hollow needle, under cocain anesthesia, if pus is not found at the time of operation. Many of the descriptions of operations by this route seemed so impracticable that we evolved the following procedure which avoids pneumothorax and empyema and has been quite satisfactory.

(1) Place the patient flat on the back or with the shoulder and hip raised a little, with the right arm at right angles to the body. Tincture of iodine should be used on the skin and later on the wound surfaces before opening an abscess.

(2) See Fig. 11. Curvilinear incision to expose ninth and tenth ribs. Reflect in one flap all of the tissues down to, but not including the fascia overlying the muscles.

(3) See Fig. 12. Subperiosteal resection of 10 cm. (4 inches) of the tenth rib; removal of the ninth rib also is sometimes indicated; great care is necessary to avoid wounding the periosteal bed composed of periosteum,

Plate R. Combination drain and hemostat inflated in a liver abscess specimen.

endothoracic fascia, and parietal pleura. Close the resulting gutter immediately with a running catgut suture through the entire thickness of the musculature. This results in a loose and movable section of the chest wall.

(4) See Fig. 13. Cavity or gutter left by rib resection partially sutured. The dotted line below indicates the next incision which follows closely the upper border of the eleventh rib, is coextensive with the rib resection and extends into the peritoneal cavity dividing all layers of the chest wall and the diaphragm.

(5) See Fig. 14. While this incision is being made the fingers of an assistant firmly press the loosened chest wall inwards and against the diaphragm to prevent pneumothorax when the incision opens or crosses the pleural sac; as soon as the pleural cavity has been passed and the thickness of the diaphragm divided opening the peritoneum, which should occur first at about the center of the wound, the two upper, cut margins of mobilized chest wall and diaphragm are clamped together with two or three forceps, effectually closing the pleural cavity. The opening can now be extended right and left by first securely clamping the diaphragm to the chest wall and when a running catgut suture replaces the forceps making air tight closure of the pleural cavity, the liver is freely exposed and ready for any ordinary exploration.

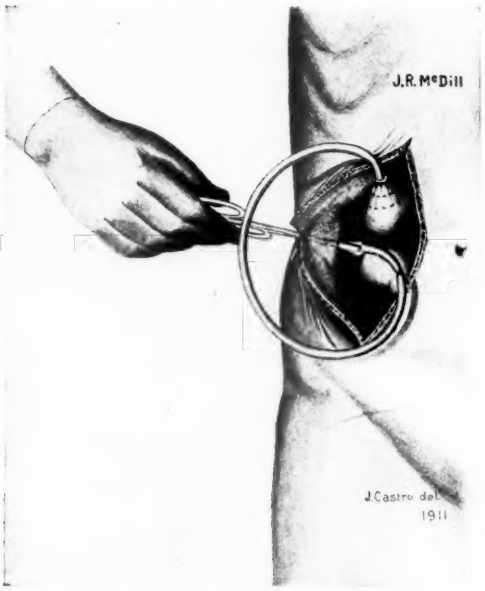

Plate X. Temporary cecostomy. Right rectus incision, greatly enlarged. First purse suture only tied.

Fig. 15. Demonstrating the cut edges of chest wall and diaphragm held apart; between the flaps the pleural cavity is shown; below is the liver.

Fig. 16. Coaptation by suture of the edges of chest wall and diaphragm completed, showing extent of exposure of the surface of the right lobe of the liver.

Fig. 17. Tube in place surrounded by gauze pack; sutured margin held up showing parietal peritoneum on under side.

Fig. 18. A case in which pus was not found at the time of operation, showing gauze packed in a Mikulicz bag, which extends beneath the wound margins covering an area of liver surface about 6.5 cm. (2½ inches) in diameter. After adhesions form the liver can be explored daily if necessary under local cocain anesthesia. In one case the abscess had not developed sufficiently to be located and drained until three weeks after the original operation.

Fig. 19. Diagrammatic sketch showing the layers incised and the digital method of preventing pneumothorax until the diaphragm and the chest wall are united.

Pneumothorax, all statements to the contrary notwithstanding, is

always a very serious accident even to a healthy man and should it occur during an operation in spite of all precautions the steps of the operation should be completed and the air, and also any fluid encountered in the pleural cavity, should then be aspirated by means of a Potain aspirator, using a medium sized canula with a blunt end. With the aid of a differential pressure apparatus the operation can be done very easily and rapidly and the pressure can be dispensed with as soon as the pleural cavity is closed. The usual enlargement of the right lobe narrows or even temporarily obliterates in some cases the base of the pleural space which greatly facilitates the operation. The right lobe after this exposure can now be palpated upwards on the dome, and on its posterior surface, downwards and forwards the anterior surface and margin and sometimes, if not greatly enlarged, the under surface can be reached by the examining fingers. The liver when acutely edematous will bulge freely into the wound, is bluish in color, and soft and pulpy to touch. The indications of underlying abscesses to the exploring fingers are peritoneal adhesions and resistance or hardness due to pus tension. Before incising a superficial abscess or before exploring with the hollow needle and syringe, pack off with a ring of gauze, which may be fastened in place by two or three No. 1 catgut stitches to the parietal peritoneum, although this is not often necessary. Sewing to the liver surfaces is seldom satisfactory. If the operator prefers to wait for parieto-visceral adhesions before opening an abscess, or if the condition of the patient requires it, fasten the exploring needle *in situ* or the cavity may not be readily found again because an edematous liver invariably shrinks rapidly in size after any operative handling. When an abscess near the surface has been opened and its cavity can be reached its walls should be palpated for neighboring pus collections, supplemented by the aspirating needle, and if the partition between cavities is not too thick it can be broken down by a long forceps; if there seems too much intervening liver tissue it can be more safely left, to work its way towards the opened cavity in which the tension has been relieved, when it can be opened later if it does not open spontaneously by confluence. We open deep abscesses by a narrow stab incision using the needle as a guide and enlarge the opening with forceps or the finger. As soon as the abscesses are opened insert a large rubber tubular drain, stop, and put the patient to bed. Flushing, curetting, sponging out, etc., are all contraindicated. The causes of death in this class of cases are too often due to too much operating, the anesthetic, loss of blood, and shock. These operations can be suspended at any moment after the liver has been exposed and can be completed later under local anesthesia.

Treatment of hæmorrhage from the liver. Normally the liver blood pressure is very low, but in a considerable percentage of chronic dysentery cases, some hepatic condition has developed which may cause enough obstruction and consequent increase of intravenous portal blood pressure, that the back pressure will produce in liver wounds of such organs the most furious type

of venous hæmorrhage that we have ever encountered, and, unless checked immediately, it will exsanguinate the patient in a few moments. To meet this emergency we have recently devised a combination drain and hemostat as follows: Two rubber condons one inside of the other with their blind ends perforated to allow of the passage through of a medium or large sized non-fenestrated 13 cm. (5 inches) long rubber tube with thick and strong walls; the ends of the condons are lashed with silk thread to the tube converting them into an air tight cavity traversed by the rubber drain. A small 25 cm. (10 inches) long rubber tube with a piece of glass tubing 2½ cm. (1 inch) long set in one end is then inserted laterally near one end of the bag through a small puncture; the sides of the condons are drawn up about this tube and firmly lashed to it with silk thread. The apparatus can now be inflated with air blown through the smaller tube. It is well to have different sizes of them prepared and it is important that the quality of the rubber goods be of the best. Plate R shows the apparatus distended in a liver abscess specimen. The advantages of this simple and always available arrangement are that it acts at the same time as a drain and as a hemostat; it can be inserted and inflated in a few seconds; it produces efficient, uniform, and equable pressure upon all parts of the irregular bleeding surfaces of any tunnel made through the liver substance to open an abscess or for a trauma from any other cause. The pressure can be regulated as required, can be easily renewed in case of slight leakage of the air or another apparatus can be quickly substituted in case of rupture of the balloon. It is easily removed by traction on the drainage tube, after cutting the outside silk ligature, which inverts the bag from within outward. In one case the Kelly speculum (see cut of instruments) through which a long, wide, doubled, gauze bandage was packed, controlled an alarming hæmorrhage.

The after treatment consists in resuming the local treatment of the primary intestinal lesions as soon as possible, and the abscess cavities are irrigated daily with 1 to 1,000 sulphate of quinine solution: the patient is encouraged to sit up as soon as he can comfortably and is given all the nourishment that he can digest and assimilate.

Comments. Access to the liver should be procured by a transpleural operation as soon as symptoms indicate involvement of the right lobe, through which explorations for pus can be made with safety as often as desired, until it is located and drained. When the signs point anteriorly it often means the less common multiple abscesses of the under surface, the anterior portion, and the left lobe, and a high abdominal incision is then indicated through which to locate as many abscesses as possible and to treat all that can be handled by this route; others may require a transpleural opening that can be readily made at the same time, if the patient's condition permits, with the assistance of one hand inside of the abdomen if necessary to press the diaphragm against the chest wall while cutting across the pleural sac.

A combined abdominal and transpleural method with the primary ex-

ploration in all cases through the abdomen is advocated by some. This anterior wound can not be used for future explorations; a deep lying or beginning abscess in the right lobe, can not be accurately detected by palpation or by a needle, and if it could be and if the pus was demonstrated by the exploring needle it then usually becomes necessary to inflict the additional transpleural operation in order to drain. If the patient's condition should not justify the second operation at the same sitting, the abdominal operation was unnecessary because it is generally impracticable to drain a high or a deep-seated abscess anteriorly and even if the needle has located pus it is useless as a guide for a later operation because the liver which is usually swollen will diminish so rapidly in size that after twenty-four hours the site of the abscess will have receded upward and under the diaphragmatic arch and beyond reach for drainage through the abdominal incision. If the abscess is opened anteriorly the tube must be sutured to the opening in the liver to prevent it from being dragged out of the cavity when the organ shrinks. If, however, abdominal exploration is made without immediate result as to liver abscesses, and the organ is found enlarged and edematous with a gall-bladder distended with dark and thick bile, cholecystotomy and an eight day drainage is always indicated.

Many cures have been reported by aspiration and syphonage, a ready and easy method for which a special set of instruments was devised by Manson. This operation which works in the dark has no terrors for the most timid surgeon, but it is unscientific, unsurgical, and unsafe. It has its uses, however, and is to be commended to one unskilled in surgery when the conditions are such that proper hospital care is not available.

The scope of the transpleural operation described can be extended to conditions requiring freer exposure of the right lobe, by additional rib resection and by enlarging the opening upward from the center of the original incision between two clamps, being careful not to include the lung; before dividing between the clamps a mattress suture should be placed through all layers of chest wall and diaphragm just above the upper end of the proposed incision or about where the ends of the forceps form an apex.

A point in the technique of repeated punctures with the exploring needle, which is often necessary before the pus is located. Use needles of large caliber which attach to the syringe, which must have a glass barrel, by a socket instead of a screw; keep the needles and syringe in a basin of hot normal salt solution, drawing the salt solution through the needles frequently in order to avoid troublesome clotting of blood in the lumen of the needle. The Potain aspirator is also very useful during this step.

LIVER ABSCESS—CONCLUSIONS

1. Liver abscess as a complication of amebic disease of the colon always has amebas in its wall as the specific pathogenic organism of the disease.

2. This complication can be reduced to a minimum by early recognition and proper treatment of the primary intestinal amebiasis.

3. Solitary abscesses, which are sometimes formed by confluence of more than one, are the only ones, so far, amenable to successful surgical treatment, which is by drainage.

4. The best route to the liver for exploration and drainage is by transpleural methods, which avoid lung collapse.

5. Early operations are most favorable and 90 per cent of operable cases coming promptly under surgical treatment should recover, if the primary intestinal disease is controlled during convalescence.

ROUTINE TEMPORARY CECOSTOMY VERSUS APPENDICOSTOMY FOR INTRACTABLE DYSENTERIC COLITIS

We have had five cases of amebiasis recover on a full diet and on getting them out of bed, which were sent for appendicostomy as a last resort; but the direct irrigation of the colon from its cecal end is indicated in some intractable cases of amebic dysentery as well as in other severe chronic ulcerations of the large gut, and the results are very gratifying. Successful appendicostomy needs an appendix made to order. What seems most desirable is some simple and safe form of cecostomy that can be adopted as a routine operation both by surgeons and by the occasional operator. The rôle the appendix plays in reflex disturbances when pathologic is well known, and the final condition of the organ after appendicostomy is anything but normal. This undeveloped distal portion of the primitive cecum with its susceptibility to inflammations, due to the preponderance of lymphoid tissue, defective drainage, defective structure, and defective blood supply, is not found normal enough in one case in four to furnish a safe organ for appendicostomy.

In other than expert hands it is certain that a large number of appendicostomies which have not been reported have resulted disastrously. It is only recently that an improved technique with a cecostomy alternative has been described, and the number of cases will never be known in which the mesoappendix was divided, damaged, or put on a stretch, cutting off the blood supply, and the organ then suspended from the skin only, without attaching the cecum to the parietal peritoneum, with consequent gangrene of the appendix and retraction into the abdomen. Appendicostomy even as improved by Tuttle, Meyer, Dawbarn, and others is not satisfactory. On general principles and from surgical instinct the only proper thing to do to an appendix that falls into our hands is to obliterate it.

TECHNIQUE OF THE OPERATION

1. Through a right rectus or through a McBurney incision, as preferred, make a rapid appendectomy, and look for a Lane kink.

2. Through a small buttonhole incision in the skin about 2.5 cm. (one inch) above and 2.5 cm. (one inch) behind the anterior superior spinous

process of the ilium, tunnel with a pair of straight hemostats into the abdominal cavity and snap the forceps onto the edge of the peritoneal opening.

3. Pack off the intestine if necessary; replace the cecum *in situ* and pick up with a pair of forceps that bit of its surface that lies next to the perforation made in the parietal peritoneum; from that point or near to it perform a cecostomy according to the Stamm-Kader or the simpler Senn principle of gastrostomy.

4. Select a velvet eye catheter of medium size, ligate it near its outer end, and cut it to a point; around the bite of the forceps on the cecum run a purse suture of strong linen through all coats; remove the forceps on the cecal wall and make a small opening through all coats; insert the catheter upwards and into the organ 8 or 10 cm. (3 or 4 inches), invert the edges of the cecal wound, tie the linen suture tightly and cut short; with No. 1 catgut, using the same strand, circle the tube with 2 or 3 more purse sutures 5 mm. ($\frac{3}{16}$ inch) apart tying each firmly to bring the peritoneal surfaces closely against the catheter; scarify the visceral peritoneum with the needle for 2 cm. ($\frac{3}{4}$ inch) about the tube and to the same extent about the opening through the parietal peritoneum.

5. Grasp the pointed end of the catheter with the forceps left hanging on the inner margin of the tunnel through the abdominal wall and withdraw it until the cecum is snugly coapted to the parietes; fasten the cecum to the parietal peritoneum with catgut and the catheter to the skin with a silkworm gut suture which must include some of the wall of the tube; begin irrigations in three or four days.

The first purse suture of linen will find its way into the gut eventually and the advantage of it is believed to be that if tightly tied it will hold the opening in the cecal wall longer and more surely in place than catgut and thus ensure a length of serous lined canal that will close at once on removal of the catheter.

Should any leakage or infection occur the tunnel through the abdominal wall occupied by the catheter is placed exactly right to provide drainage from the site of the intestinal operation. No abnormal position of the cecum can result and no secondary operation will be necessary to close the fistula.

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DEPARTMENT OF TECHNIQUE

THE OPERATIVE TREATMENT OF CHRONIC OSTEOMYELITIS.

By CARL BECK, M. D., Chicago, Illinois

DURING the last few years I have had occasion to observe in my practice quite a number of inflammatory diseases of bones, acute and chronic.

The treatment with the bismuth paste advocated by us has aroused a great deal of interest in the profession and quite a number of patients have been referred to us for examination and treatment of chronic bone lesions. Most of these cases had been treated for some time, often for years unsuccessfully. This large material has given to me the chance to study the question of operative treatment of bone lesions and its ultimate results, since most of these cases had been operated once or many times before they came under my care. Many of them were foreigners and the men who had treated them were in some instances surgeons of great prominence, so that we may infer from this they had been operated upon lege artis.

The most varied methods of operation had been used, and from the result some deduction could be made in a good many instances as to the value of different operative methods which are used universally now and recommended in textbooks for the treatment of inflammatory diseases of bones. In discussing the operative treatment of chronic inflammation of bones, may we ask ourselves whether they ought to be treated different than other structures.

Bones do not differ materially in their reaction towards the cause of inflammation from other tissues. If we compare the appendix and the bone as to their relation and reaction towards inflammation we must say they answer almost in the same way. They are exposed to the same causes of inflammation and they answer in the same manner. We have a great deal of parallelism in both tissues. While on one side there are soft tissues, muscle, mucosa, peritoneum, we have on the other side hard bone with calcareous matter, a highly vascularized periosteum, and peculiarly structured marrow. The differences of reaction will be from the differences of structure. But we have in one case like in the other the acute inflammation with the infiltration of leucocytes leading to the formation of an acute abscess or to the dissolution and involution of the inflammatory process. We may observe the formation of new and solid connective tissue in chronic inflammation, a hardening or sclerosis or still in another instance the formation of tissue which is entirely deprived of nutrition, necrosis. All the forms of regressive changes known in pathology may be resulting from inflammation in bones, liquefaction, colloid formation, caseation, suppuration, necrosis, besides attempts of repair and real repair. In this latter respect the bone differs somewhat from the other tissues. While in other tissues the healing process leads to scar formation and hardly ever to new formation of highly organized tissue, it is in the bone where new bone tissue is formed on top of an old inflammation or surrounding the old inflammatory focus, and in this particular instance we see that the repair often outgrows the damage, so that we have as a result of a chronic inflammation often a great deal of new formed bone, surrounding the old focus of inflammation or a dead bone (Coffin).

The cause of inflammation of bone is in most instances the invasion of micro-organisms. They reach the focus in most instances by the way of the blood stream and only in some cases from the outside by contiguity, for instance, in a case of inflammation of a finger by a punctured wound the inflammation may reach the bone of the phalanx through the periosteum from the outside, but this is not the rule. In most instances the bacteria come through the blood stream. Since the nutrient artery has a constant anatomical location and since the infective material comes in the shape of emboli of clusters of micro-organisms from the smaller arteries to the capillaries, these capillaries become the seat of the embolism of these micro-organisms. They are end capillaries of the nutrient vessels of the bone. This is the reason why the inflammatory changes have such a constant location. For instance, in the femur in most instances in the lower third, in the tibia in the upper third or in the lower third, or throughout the whole tibia, and so on. Different

micro-organisms seem to have different predilection as far as the bones are concerned, so that tuberculosis, as we know by experience, settles in the neighborhood of the line between the diaphysis and epiphysis, or in the epiphysis itself, very seldom in the diaphysis. The acute and chronic inflammatory changes, due to the staphylococcus and streptococcus, usually on the distal part of the diaphysis, the syphilitic inflammation most in the diaphysis itself, particularily in the periosteum. These peculiarities have a great bearing upon the treatment.

It is the object of this paper to discuss particularly the surgical treatment of chronic non-tubercular inflammation of the bone. In looking over the text-books we find that there is a great diversity of opinion as to the value of the different methods of surgical treatment and from the study of these large number of cases which have come under our observation, I may say that this diversity of opinion is justified.

When considering the surgical treatment of chronic bone lesions, two questions are always before me in my mind:

1. Is an operation indicated or advisable?
2. What method is to be used?

First, the indication. The necessity of interference is often the result of one symptom, the pain. Pain is the most important and most common symptom of all the inflammatory changes of bone. It is characteristic particularly for the acute inflammation. Abscess and chronic suppuration is the other symptom which brings the patient to the doctor.

Pain and abscess formation are the two main indications for surgical interference. They usually go together, the pain caused by the pus being pent up in a hard bony cavity. As soon as the pus has a free flow, the pain usually ceases. If suppuration alone is present without pain, the patient as well as the doctor often don't pay any attention to the disease, and this class is the one which becomes the chronic sufferer of bone disease. Sometimes these cases are treated and sometimes many operations are performed without success. This is a class of which I speak more than of any other. Indication in these cases as to operative interference depends largely upon the factor which produces this chronic suppuration. The causes of the same are manifold.

Nature often performs the work of the surgeon by allowing the pus to burrow an opening towards the outside, emptying the pus and keeping up the suppuration. Many cases of suppurative bone diseases have spontaneous closure of the pus cavity. In some pathologic conditions particularly the tubercular the spontaneous opening of abscesses is the rule. Not only does the pus empty through one place but through many, and so it happens that we find a good many openings on the surface of the skin, each one discharging pus or pus-like fluid while the lesion of the bone keeps up progressively destroying parts of bone. It interested me to see how far the surgeon did better work than nature itself, by comparing some of the cases which have been treated by surgeons with some of those cases of plain osteomyelitis which have been opened spontaneously. The openings which nature had formed were of some constancy as to their location, showing how these processes follow certain rules and certain laws. The fistulæ were determined by anatomical conditions, the pus always burrowing in the direction of least resistance. For instance, in osteomyelitis of the lower femur we could see that in almost all cases that the fistula which had opened spontaneously was on the side of the femur corresponding to the groove formed by the quadriceps muscle on one hand and the flexor muscles respectively and tendons on the other. These fistulæ are so similar that we could often say before-hand that these cases had a spontaneous opening and they that had not been cut open by a surgeon. This applies also to the fistula on the outside of the deltoid muscle in osteomyelitis of the humerus, and also to the lateral position of the fistula opening near the elbow joint, between the triceps and the groove of the biceps, also to the characteristic openings of the psoas abscess due to the osteomyelitis of vertebral bodies. These hints thrown out by nature have been accepted by surgeons who open the abscesses usually in the same places as nature has shown them the way. Another question which interested me very much was how much does the surgeon and how much nature do in each particular instance. Nature opened the abscess on the outside, the pus is usually discharged and that is all, it keeps up discharging for some time or for a long time or perpetually according to certain laws, or causes. The surgeon as a rule did the same only he did a little more, he opened and scraped out. Nature throws out gradually some particles of dead bone if it can, the surgeon often enters with blunt instruments and bluntly scoops or scrapes out in the dark whatever he could get hold of, necrotic bone.

This brings me to the second question, namely the method of operation of osteomyelitis, and particularly of the chronic kind.

In most of the older text-books, the method which I have described in a few words before was

all that was indicated. Open the abscess, enlarge it over that part of the bone which contains the focus of inflammation, or the dead bone, the "Coffin or Todtenlade" make an opening big enough to enter the same with the sharp spoon, then scrape out and clean out all necrotic bone that you can get hold of. The result of this treatment was that in most instances the inflammatory change, consisting in a partial necrosis of the bone, has been transformed into a chronic suppurative cavity of the bone, constantly discharging from one or more fistulæ. Patients were not suffering, though they were uncomfortable. In the eyes of most men they were however cured, because the pain had disappeared.

Modern surgeons have tried to obviate this by trying to get a real cure and they have advocated different methods to accomplish it. They see the necessity of obliterating the cavity which has formed in the bone after the diseased part has been scraped away or discharged by nature. They know that wound healing in the bone requires the same conditions, namely, the coaptation of the wound borders as in wounds elsewhere. Just as little as a wound in the skin would heal, if its borders were kept apart, either by mechanical means or suppuration or by foreign bodies, the bone wound does not heal, if it cannot be coapted, either by approximation of the bone itself or by filling it out with decalcified bone chips (Senn) or covering the wound with Thiersch grafts, or muscle flaps (Neuber) or Schulten's method of bone apposition. It is immaterial which, but some method had to be invented, in order to bring the borders of the cavity together and allowing them to heal, as wound healing requires. A sequestrum must be removed since it acts as a foreign body. These two methods, namely, the simple opening of the bone cavity and scraping it out indiscriminately, and the second method of trying to fill it out in some way, are the methods which were used in most of the cases which have come under my observation, the cases having been operated by different surgeons in this country and abroad. Quite a number came from Germany and Austria, some from France, a number from the Northern Scandinavian countries, and a great many from American surgeons of note and some of less note. All these men were competent and certainly did their best, so if the result was not good, it was due to faults in the methods.

In looking over the results obtained by these different methods I must say that I have to distinguish between particularly two kinds of lesions, one large group of pathologic conditions is the one which is caused by non-tubercular infec-

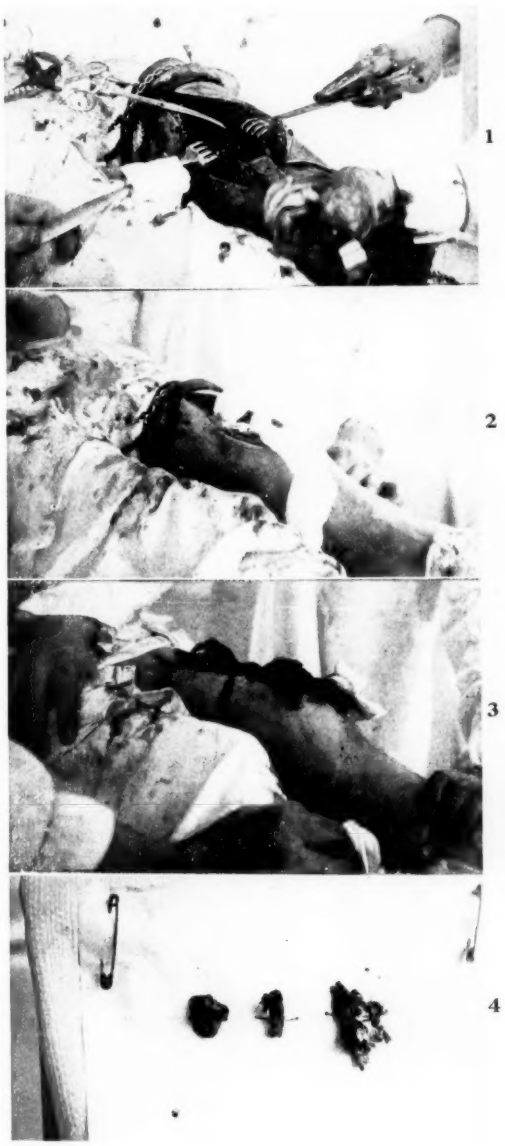

Plate A. The stages of the operation for osteomyelitis in the lower third of the femur. 1. Opening the bone and chiseling away of the overhanging bone with a conservation of the periosteum. 2. The cavity packed with gauze. 3. Packed with gauze and sutured temporarily. 4. Sequestra removed.

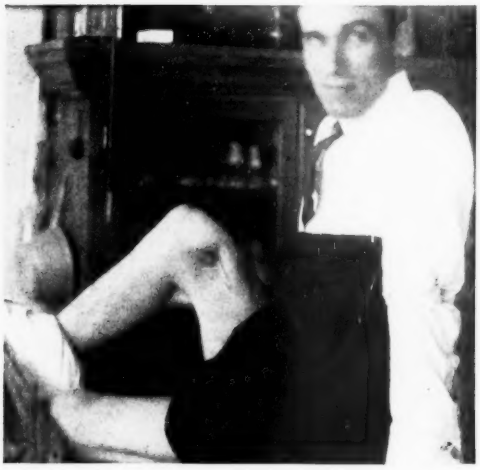

Fig. 1. Mr. B., operated on four times by the median incision over the quadriceps, showing that he uses his muscle perfectly. The flexion.

Fig. 2. Same patient with his leg extended.

tion of the bone, and the second one by tubercular infection. The latter group must be excepted as no method can be responsible for the result, the disease hardly ever being local. In the first group some methods have been successful to a degree, but in the majority of cases they have been unsuccessful, and notwithstanding the fact that in some of the cases a dozen or even more operations have been performed, the discharging sinus of the bone persisted and gave in some instances more trouble to the patients than the original disease and caused them to seek relief by non-surgical methods. Most of them expected to be healed by the injections of bismuth paste alone and a good many were, in a remarkably short time, but if treated in a certain way, which I describe later, there should be little room for poor results. Many had to be reoperated.

Before I go into the discussion of the factors which I think are responsible for the poor results, I must say something more about the physiological conditions of wound healing of the bone. Ollier has given us the best treatise on the formation of new bone from the periosteum in his great book on subperiostal resections. His experiments and those of other scientists have shown conclusively that bone grows from the periosteum in particular. If we have periosteum, we do not need bone itself, as it forms readily from the former. Bone can form from transplanted periosteum. We can successfully remove the whole bone, and if we leave the periosteum, it will form new bone, of the same shape as it was before. If this is the case it seems that we should preserve as much as possible the periosteum of any bone we are operating upon. If we can do this, and can depend upon the fact that the bone forms again if the periosteum is left, I see no reason why we cannot remove as much bone as we care to and still, after the healing takes place, receive a bone of almost the same shape as it was before resection. If we can do this, I see no reason why we should leave any cavity in the bones at all, and it seems to me of the greatest importance that we should preserve periosteum, and operate so that no cavity formed of solid bone may be left behind. Observation of all the cases which have come under my care have convinced me that the permanent fistulæ were in almost every instance due to the fact that a cavity formed by solid bone had been left behind, which could not heal because of the mechanical difficulty. I thought it advisable to obviate such conditions, and I have found that in many instances, by dealing with this factor alone, I could bring about healing in a short time in many of these cases of fistulæ which had resisted surgical treatment. I have therefore worked out a method of operation for the different kinds of osteomyelitic infection, which will be consistent with the two demands; in the first place remove all the diseased tissue in the bone, and second, leave the bone in such a condition that a cavity formed of solid bone is avoided. In order to be able to do this satisfactorily it sometimes becomes necessary to employ different modes of attacking bone from such as have heretofore been used. I have formed and follow certain rules for these operations, but each individual case must

Fig. 3. Showing osteomyelitis of the tibia before operation.

Fig. 4. Operation completed. Wound packed with gauze.

be treated individually, without adhering strictly to any iron clad rules of a method of operation. It is hardly possible to give a universal method of operation in a case of osteomyelitis, much less than in any other part of surgery. We cannot say, make such and such an incision, then open your periosteum in such and such a line and to such and such an extent and remove such and such a part of the bone, chisel down so and so far and leave the cavity in such and such a shape, because it depends entirely on the extent and location of the pathological lesion how much you remove, and how much you leave behind. But on the whole, these three points which I have made before, namely,—to open broadly, leave the periosteum intact as much as possible, remove all the diseased tissue, leave no cavity behind, are paramount.

In order to elucidate these methods of operation a little more in detail I will describe the operation of a chronic osteomyelitis of the femur, and one of chronic osteomyelitis of the tibia, which are the most common conditions in this line that come under our observation, and I shall illustrate the same with a number of pictures showing how these two methods are used in a specific way.

The case illustrated herewith is one which has been of long standing, operated upon three times by two different surgeons, being a case of osteomyelitis of the femur dating back for several years. It started originally in the usual manner, with fever and pain in the leg, the abscess opened up and pus discharged from the typical point on the side. The surgeon was called, he enlarged the opening, then scooped out all the dead tissues he could get hold of with his spoon and left a drainage. Then he made a counter drainage on where nature had not opened the femur. Suppuration kept up. The patient remained in bed for a long time, another surgeon was called. He also enlarged the opening, chiseled away part of the bone on both sides as far as he could, cleaned it out as well as he could, and after packing, left the cavity for healing. He repeated it at another time, but it would not do well, and in this condition with chronic suppuration, the patient came under my observation for bismuth paste treatment. The usual X-ray pictures were taken and it was shown by them that there was still some sequestrated bone present in the marrow canal. Therefore the indications were to go in again and remove the same, but even if I had removed all the necrotic bone through the same opening, as I had it before me I could not have expected a union or healing, because the cavity could never have grown together, and the bismuth treatment, which would have been used in this case, might have been used for some time, but against great odds because of mechanical difficulties and therefore with very little prospect of success.

I may state here, that this case, like many similar cases, had been treated with bismuth, some of them healing only to open again, some remaining healed. But on the whole, those in which the bone cavities were narrow channels gave the best prognosis with the paste, those where large cavities with bony walls were present continued suppurating until another operation removed this obstacle.

Our operation was as follows: The first step was to gain access to the cavity in such a manner that every particle of necrosed bone could be removed. Departing from the usual method of incision, I made an anterior incision right through the musculus quadriceps down to the bone. This is contrary to the accepted rules of surgery in

Plate B. Successive stages of operations on the tibia for osteomyelitis. 1. The cavity which is to be obliterated. 2. The overhanging ledges. 3. The stages of the operation where the ledges of the tibia have been cut down so that only the posterior part of the tibia is left. Total obliteration of the trough. 4. The cavity obliterated and transformed into a flat trough.

this region. The objections against this incision are that in going through the muscle it must destroy part of the muscular tissue, and being particularly close to the patella, it is hard to obviate an opening of the suprapatellar bursa. But in a large number of cases in which I have done this I found no harm resulted and I have never cut into the joint or bursa. Gaining access to all the parts of the bone without disturbing the bursa, and as it was afterwards shown, without any defects to the muscle, is a great advantage, in this incision. Patients use their muscle well after the same was incised, not once but twice and three times. Figs. 1 and 2 shows a patient who had to be operated upon four times, every time going through the muscle. The reason for these incisions were always discoveries of new foci of necrotic bone and nevertheless this patient has perfect motion of his quadriceps femoris.

The periosteum is incised and separated carefully as far sideways as it is necessary, then with a chisel, bone is excised and chiseled away in such a manner as to leave a very shallow trough without any walls on the side so that the periosteum can fall and close in readily the new space, if there be one. The greatest difficulty arises if the process reaches into one of the condyles. In this case a part of the condyles had to be removed also in such manner as to leave no cavity of any extent. In some cases I have found it more advantageous to take the bone off the side of the femur instead of anteriorly. That is, take off half of the bone from the front backwards so that only one lateral half was left. In another case it was more advantageous to remove the posterior half of the bone, but in all these cases the bone grew rapidly from the periosteum and after a time there was nothing visible of any defect. In this particular instance the steps of the operation are shown in different pictures given herewith. After the sequestrum had been removed and the bone leveled down to a very flat shell, the space which was thus created was packed with gauze. We suture as little as possible. About three days later the gauze was removed and a non-bleeding surface was seen to line the whole defect. Muscles and periosteum fell into it easily and covered it up, It was filled up with bismuth paste. This filling up was continued for a number of days while the skin was drawn together by secondary sutures or simply by adhesive plaster and very shortly afterwards union took place.

In some instances the discharge kept up for some time, particularly if we were not fortunate enough to obtain the trough so flat that a cavity

could not be entirely obviated. Altogether I have treated chronic osteomyelitis of the femur in a great number of cases in this way with very satisfactory results.

Still more satisfactory are the results in such operations on the tibia. In this bone a trough formation is much more easily formed than in the femur, as the accompanying picture shows. Incision is made along the long axis of the tibia. If the head of the tibia is considerably involved a great deal of the anterior surface of the enlarged bone is removed and particular care is taken here that there should be no cavity, or a very little and very shallow one left.

The same applies to the tibia near the tibiocrural joint in the neighborhood of which the difficulties are also more pronounced than in the shaft of the tibia. In the tibia I have more than once had occasion to remove the whole bone of the tibia leaving nothing behind but the periosteum, from which new bone was formed very rapidly. If the bone was very poor or permitted of leaving only a very small strip, I found it better to remove the entire bone, then close the periosteum with suture, filling up the cavity for the first few days, after the gauze had been removed, with bismuth paste and gradually allowing the formation of bone.

I am giving herein the successive pictures of one such case in which the tibia has been removed, because it was a central necrosis, parts of bone only coherent with the periosteum on a few spaces. In this instance newly formed bone was removed because it was very irregular and would have kept up suppuration for some time. I make this a rule if the newly formed bone is not strong and healthy, as this will also leave a bony cavity to be filled up. In a number of instances of tibial osteomyelitis I have been able to obtain a great deal of good and rapid results, by removing a great deal, leaving only a thin ridge behind or on the side.

This treatment is applicable also in other regions of the body where osteomyelitis is affecting the bone, but where the process is not of tubercular nature.

In tuberculosis the procedure is similar but must be modified greatly, considering the nature of the disease, and the very different effect that tuberculosis has on the bone, which it invades and particularly the easy involvement of the joints in this kind of osteomyelitis.

Summing up I would say that in the surgical treatment of chronic osteomyelitis, particularly of long bone, three principles should be observed:

Fig. 5. Skiagraph showing a case in which the whole tibia has been removed and the cavity of the periost, from which all the new formed bone has also been removed, filled with bismuth paste. At the present time the tibia has reappeared in new formation.

1. Remove all diseased bone. In order to be able to do that one must make a very extensive incision if necessary.

2. Save the periosteum as much as possible. Sacrifice as much as necessary of the bone, leaving as much behind as is necessary to give the bone a form, and depend upon the periosteum for formation of new bone.

3. Avoid the formation of irregular cavities which do not allow a mechanical closure of the wound. Continue the taking X-ray pictures during your after treatment so as to be sure that no dead bone has been left behind and that you have obtained such forms of bone as will allow mechanical closure. It is often impossible to select particles of necrotic bone inclosed in small cavities except by repeated X-ray photography, particularly by stereoscopic views, the diagnosis of which I have described in a previous article in this journal.

THE CONTINUOUS INTRATRACHEAL INSUFFLATION (MELTZER–AUER) IN INTRATHORACIC OPERATIONS IN THE HUMAN SUBJECT WITH DESCRIPTION OF AN APPARATUS[1]

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THERE is no branch of surgery to-day which attracts more attention among physicians and especially surgeons than intrathoracic surgery. Barely seven years ago the thoracic cavity was "a noli me tangere" for the surgeon. He did not dare to open the thorax freely, in order to attack diseases of the lung and esophagus, as he would the abdominal cavity. The ingenious invention of Sauerbruch only made the opening of the thorax a safe procedure as far as death in consequence of pneumothorax was concerned.

In this paper I will not discuss the value of the different positive or negative pressure apparatuses which have been constructed and employed by different surgeons. Their number is already a large one, some of them very elaborate, very expensive, and doing excellent work, others simpler and also sufficing for the purpose. I only want to state here that the contention made that negative and positive pressure are distinctly different in their physiological aspect cannot be upheld any more. Kuettner,[2] Dreyer and Spannaus[3] have lately positively proven that there exists no physiological difference between the two methods.

The most complete apparatus is probably Dr. Willy Meyer's combination chamber for positive and negative pressure. It necessitates, however, a special room and is very expensive. Although in surgery for the safety of the patient the best and most expensive is just good enough, I think that in the long run a simple and at the same time safe apparatus will be the one universally employed.

A very simple and ingenious method has been devised of late by Dr. Meltzer and Auer of this city. This is also a positive pressure method, although the principle involved is somewhat different.

In studying the nature of the mechanism of respiration in the presence of double pneumothorax, while the animal is breathing compressed air by the positive pressure apparatus of Brauer, Meltzer and Auer[4] discovered the fact that under certain conditions respiration can be carried on by continuous insufflation of the lungs and without any normal or artificial rhythmical respiratory movements whatsoever. These two observers carried on a large number of animal experiments and in a paper read before the Academy of Medicine, February 17, 1910, Meltzer[5] published his classical work on continuous intratra-

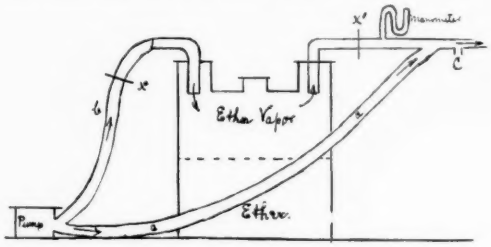

Fig. 1.

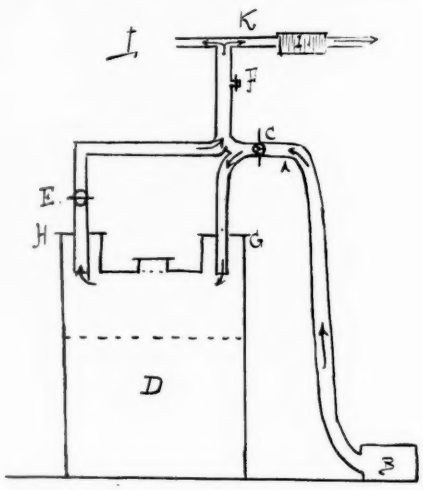

Fig. 2.

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[1] From the Surgical Division of the German Hospital in New York, Dr. O. Kiliani, Attending Surgeon. Received for publication, August 5, 1911.

cheal insufflation, as means of avoiding pneumothorax during intrathoracic operations.

The method consists in the following: A soft rubber tube, preferably with the opening at the end, is introduced into the larynx of the animal and pushed down into the trachea until a resistance is met. It is then withdrawn for about one inch. The end of the tube is now lying in the trachea just above the bifurcation. It is essential that the tube be not longer than one-half to three-fourths of the circumference of the trachea, so that the air which is pumped under pressure into the tube down to the bifurcation finds ample room to escape through the space between tube and tracheal wall. This tube is connected with a three-neck Wolff bottle containing ether from which another tube leads to a pressure pump. This is in principle the simple apparatus which is necessary. (Fig. 1.) For the purpose of only using air without giving ether a second tube *a* is attached to the apparatus which only carries air to the lungs when the tube *b* is clamped at *x* and *x'*. If we want to supply a mixture of air and ether, the tube *b* is clamped only at *x*. The air from the pump passing through a into *b* will suck along enough ether to keep up the anæsthesia. At *c* an outlet is provided which can be closed or opened by a clamp. This is a sort of safety valve the opening of which for a moment reduces the intratracheal and intrapulmonary pressure and thus insures efficient exchange of gases. Meltzer found it sometimes difficult to gauge the size of the intratracheal tube and adjust it properly. In experiments in which the color of the lungs and the action of the heart indicate the imminent danger of asphyxia, it was found that the interruption of the air stream for a second or two would avert the danger. Furthermore, Meltzer thinks that the momentary collapse and distension of the lungs materially assist in the interchange of gases within the bronchi and alveoli. Of course it is not necessary to have the lungs collapse completely, the opening of the clamp for a second a few times during a minute is sufficient (Meltzer). This, however, is only necessary when the tube happened to be too large. In my animal experiments I have never used it and had no acci-

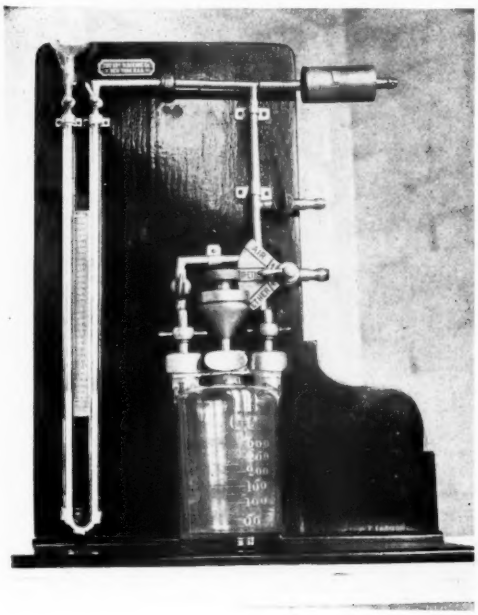


Fig. 3.

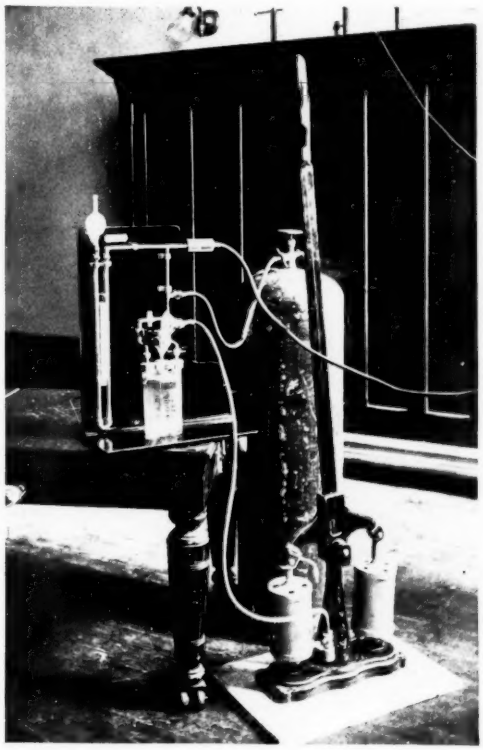


Fig. 4.

Fig. 5.

dents. Once it happened that the tube in the trachea was too small and after opening the thorax, it was found that the lungs were not properly distended and were of a purple hue. Slight compression of the trachea by the fingers of the narcotizer sufficed to do away with the danger of asphyxia. At any rate it is advisable to use this little device in order to insure safety and I certainly recommend it in all cases where the method is tried in human beings.

Meltzer, Auer, and Elsberg, who have made numerous experiments on dogs, never saw any ill effect after the method as far as the upper air passages and the lungs of the animals were concerned. Carrel, who also used this simple method in his animal experimentations, recommends it highly. My own experiments[1] bear out the opinion of the afore mentioned authors. I have used the simple apparatus as depicted in figure 1 in my experimental work on the esophagus without any ill effect on the animals. I have had not a single death which could be attributed to the method itself, neither did the autopsies reveal any pathological condition of the upper air passages that could have been caused by the intratracheal tube. I always worked with a pressure of 10 to 20 mm. Hg. This is perfectly sufficient to

[1] I wish to thank Professor McCallum, through whose kind permission these experiments were conducted at the Pathological Laboratory of the College of Physicians and Surgeons, New York City. I also want to express my appreciation of the valuable assistance rendered to me by Drs. Hellman, Blumgart, Sanford, and Petersen.

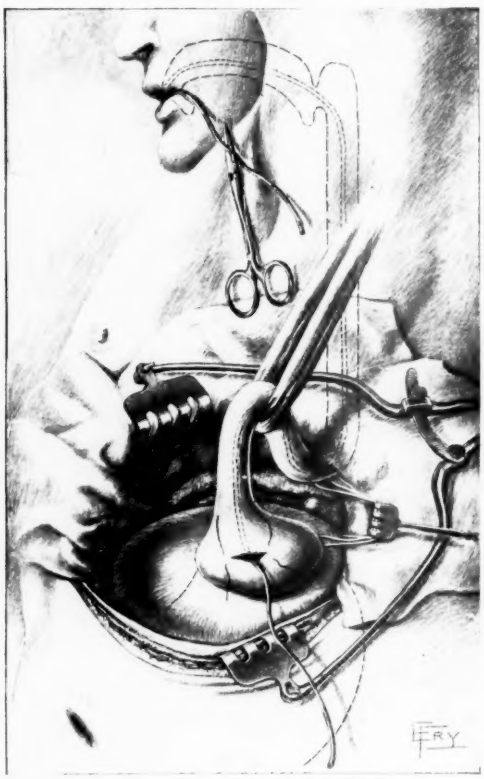


Fig. 6.

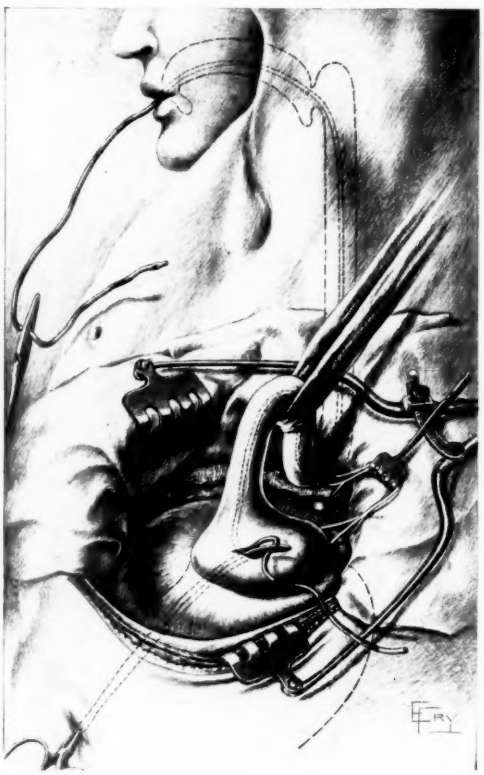


Fig. 7.

distend the lungs and insure a sufficient exchange of intrapulmonary gases. Under this pressure the lung shows its normal pink color and the rhythm of the heart beat is regular and of normal frequency. I think it is important not to go above this pressure. The possibility exists by too high an intrapulmonary pressure of rupturing air vesicles or of exciting the pulmonary vagus filaments to inhibitory reflex action upon the heart, thus causing a paralysis of the heart muscle. It is therefore advisable, if the heart action becomes too slow, to administer atropin, which with great certainty will counteract the inhibitory vagus influences. There is also danger by too high a pressure of capillary compression with high pressure in the pulmonary vein and consequent overtaxing of right heart.

If the lungs are not distended by this pressure of 10 to 20 mm. Hg., the fault lies with the intratracheal tube. There are two possibilities: (1) The tube is pushed down too far and lies in one of the bronchi, usually the right one; (2) the tube is too small and too much air escapes through the space between trachea and tube and not enough air enters the alveoli of the lung. In the first instance the tube has to be retracted a little; in the second case slight compression of the trachea around the tube at the jugulum will suffice to do away with the escape of too much air beside the tube. By no means must the tube be too large so that it fills the greatest part of the trachea. Under these conditions there is no interchange of gases in the alveoli of the lungs. The lungs will be distended, but the carbon dioxide will have no opportunity of escape and the animal will die of asphyxia.

In our animal work and in the two cases on human beings we have not used an air filter nor have we warmed the mixture of ether and air before it enters the trachea. All observers that have worked with this method and myself have never seen any ill effect from it. If we consider the fact that our respiratory organs are in closer contact with the outer air than any other organ in the body and that it takes in daily large quantities of all sorts of dusty particles and bacteria floating in the air, it seems unnecessary to filter it. That the temperature of the air is practically indifferent to the lungs seems to be proven by the fact that we breathe without inconvenience air that is warmed to 96 to 100 degrees or that is cooled down many degrees below zero (arctic explorers).

Notwithstanding, I recommend filtration of air in human beings, but think that warming of the air can be dispensed with.

As means of creating pressure I first used the ordinary foot bellows. In subsequent experiments I have been using a hand lever pump which is easily manipulated. Elsberg[1] and Nordmann[2] use an electric motor pump which gives a constant pressure. The very reasons, however, for which these authors have given up the ordinary hand pump or bellows seems to me to be an important advantage. If we use the hand pump the pressure is not constant, but there is always a slight rhythmical fall of pressure by every movement of the lever. This slight change of pressure seems to me an important factor in bringing about a thorough interchange of gases in the alveoli of the lung. I have therefore continued to use the lever pump in place of a pump with constant pressure. In the following I like to report my experiences in two cases of thoracotomy in the human being.

CASE 1. A. O., 67 years old. Admitted to the German Hospital on Dr. O. Kiliani's service, May 12, 1909. Had difficulty in swallowing previous to entering the hospital. He found that unless the food was fluid or thoroughly chewed it would not pass, but became arrested at the body of the sternum and produce a sharp pain in the thorax. This difficulty in swallowing had grown considerably worse in the last few days and patient had lost much in weight.

Stat. præs. Fairly well developed man with normal thoracic and abdominal organs.

Examination of the esophagus with bougies reveals an obstruction to all sizes at 25½ cm. from the teeth. Diagnosis was made of a stricture of the esophagus, probably carcinomatous, opposite the bifurcation of the trachea. As the man was still in a fair condition I decided to establish at first a jejunostomy for feeding purposes, followed later by an attempt to remove the growth in the esophagus by a transthoracic operation. The jejunum was selected for the establishment of the fistula to keep the stomach freely movable in order to be able to pull it easily into the thorax at the subsequent operation. Thorough oral hygienic measures were instituted. His teeth were cleansed and an antiseptic mouthwash was frequently used by the patient.

July 10, 1910. Thoracotomy under Meltzer-Auer continuous insufflation of the lung.

After deep anæsthesia with anæsthol was induced the intubation was done. A soft nelaton catheter 23 F was used. After several vain attempts it was finally effected by the use of a bent probe as stylet upon the advice of Dr. Elsberg who was kind enough to be present at the operation. The tongue was kept forward by a silk suture and the tube was fastened by a silk thread to the upper incisor teeth. The intratracheal tube was now connected with the pressure apparatus. The rhythmical movements of the manometer with the respiration of the patient showed that the tube was in place. The patient was put on his right side. His left arm well extended over his head and held there by an assistant. An incision through the skin was now made in the 8th intercostal space from the left margin of the sternum to the anterior axillary line. The intercostal muscles were carefully divided down to the

[1] Annals of Surgery, 1910.

[2] Arch. f. klin. Chir., bd. 92.

pleura. The lung was seen quietly moving up and down beneath it. Now a small incision was made into the pleura and the pressure raised to 10 mm. Hg. After it was seen that the lung stayed well distended and the color of the patient was good, the pleura was incised along the whole length of the incision and the ribs spread widely apart by a ribspreader. Pulse and respiration showed no alteration. The lung was now pushed away from the esophagus and held out of place by the use of large Japanese handkerchiefs which had been sterilized in vaseline as recommended by Carrel. The carcinoma of the esophagus was detected opposite the bifurcation of the trachea. It occupied about three inches of the esophagus and was tightly adherent to the strictures around the root of the lung. Along the whole course of the aorta were found small carcinomatous glands. The carcinoma reached above beyond the arch of the aorta and could there be palpated to our satisfaction. As the case turned out to be inoperable, it was decided to close up the wound again.

During the whole time of manipulation in the thorax the respiration was good and the heart beat normal, strong, and regular. The wound was closed by interrupted chromic gut sutures slung around one rib above and below (pericostal suture). Before tying these, care was taken to have the lung well extended to guard against air remaining in the thoracic cavity. The intercostal muscles were sewn together by a double row of running suture to close the wound. The skin was also carefully closed with interrupted silkworm gut sutures. A large gauze-cotton dressing was then applied. The insufflation was kept up until the dressing was finished. At the end of the operation the condition of the patient was good. During the operation the color of the patient was good except during the time when the lung was pushed away from the esophagus, when a slight cyanosis was present, which, however, gave no cause for anxiety.

July 24th. Patient in good condition. No cough or expectoration. No change of voice, no symptoms referable to larynx or trachea. Temperature 101,4°, pulse 96 to 120, respiration 20–28.

July 25th. Patient's condition is less satisfactory. Temperature went up during the night to 104°. Diffuse small crepitant râles over both lungs. No change in percussion note, no pleuritic exudate.

July 26th. Pneumonia is spreading and the heart is getting weaker. Patient died at 5.55 P. M., 72 hours after operation. Unfortunately an autopsy could not be obtained.

CASE 2. This case is that of a little boy, W. St., aged three. Suffering from an impassable stricture of the esophagus in consequence of swallowing lye.

The case and the operative procedure has been published by me in the Centralblatt fuer Chir., No. 43, October 22, 1910, under the title "Transthoracic Cardiotomy, a new method for the cure of impassable strictures of the esophagus."

As the procedure has not been published as yet in English I asked your kind permission to give you a short exposé of the operation here:[1]

"Under Meltzer-Auer continuous insufflation of the trachea the thorax was opened in the 7th intercostal space. The ribs were spread apart by the rib spreader. By pushing the well extended lung away from the diaphragm, it was noted that the incision was a little too high. A second incision was therefore made through the 8th intercostal space giving ample access to the lower part of the esophagus and the diaphragm. The lung was pushed upward and held out of the way by Japanese silk handkerchiefs, sterilized in vaseline. The pleura, covering the esophagus, was now split, both vagi nerves were carefully isolated from the esophagus and the latter was bluntly dissected out of its bed by means of anatomical forceps, which was easily accomplished and without bleeding. A loop of loosely folded gauze was put around the esophagus. By carefully pulling the esophagus upward by this loop of gauze, it was loosened all around from its attachment to the diaphragm, a pair of anatomical forceps was pushed through the layer of diaphragmatic pleura and peritoneum and thus the peritoneal cavity was entered. The stomach was now carefully pulled into the thoracic cavity until a point was reached about 7 cm. below the point of entrance of the esophagus. The pleural cavity was now packed off with the silk handkerchiefs, mentioned before, and a transverse incision made between two silk sutures as guide into the cardia 3 cm. below the entrance of the esophagus. Through this incision a ureter catheter was inserted, armed with a stylet and closed at the end. The stricture was thus easily entered from behind and the catheter led out through the mouth where it was secured by a clamp. A long, curved dressing forceps was now inserted into the gastrostomy opening, which was made at a previous operation, the lower end of the catheter in the esophagus was caught and pulled through the gastrostomy opening. (Figs. 6 and 7.) The two ends of the catheter were now tied together by a silk suture to guard against its being pulled out inadvertently. The incision in the cardia was now closed by a double row of silk Lembert sutures and the stomach replaced into the abdomen. The esophagus was fastened to the diaphragmatic ring by interrupted silk sutures, care being taken to grasp enough peritoneum to produce a broad apposition of peritoneum to the esophageal wall. The incision was closed in the same manner as in the first case. The operation was not a difficult one and was accomplished in 45 minutes. Pulse and respiration were very satisfactory throughout. As the patient, who for the last part of the operation had only gotten air, commenced to react, it was necessary to give some more ether. Unfortunately the wrong clamp was removed from the ether carrying tube. A sudden rise of pressure occurred in the ether bottle through which a small quantity of ether was forced into the air carrying tube and into the lungs. A sudden deep collapse occurred from which the patient was speedily roused by giving plenty of pure air through the pump. The small quantities of ether, however, were sufficient to set up a severe congestion of the lung to which the patient succumbed 24 hours after the operation.

At the postmortem examination the following conditions were found: There was no pneumothorax present. In the pleural cavity were found about 100 cc. of clear hæmorrhagic fluid. Visceral and parietal pleura was glistening. On cutting into the lung it was found that here and there scattered through both lungs, were small foci of congestion which were red in color and felt a little more resistant to the touch than the surrounding tissue. There was also present a slight marginal subpleural emphysema on the anterior border of the lower lobe of the left lung. Microscopical examination revealed a beginning brocho-pneumonia, undoubtedly produced by the droplets of ether which had been blown into the lung.

Although both my cases ended fatally, the unfortunate outcome cannot be attributed to the insufflation method. The first case succumbed to a postoperative pneumonia, an accident that can occur after any severe operation. In the second case the fault lay with the technique of

[1] Has since appeared in Surgery, Gynecology and Obstetrics, May, 1911.

the manipulation of the apparatus and not with the principle. As far as the danger of pneumothorax during the operation was concerned, there was none. The same is true for pneumonia.

In both these cases I have used the same simple apparatus that was used in my animal work. In order, however, to have an apparatus at hand which was more stable and precluded any possible accidents as the one I was unfortunate enough to experience, I had an apparatus constructed by the Kny-Scheerer Co. which I have the honor to demonstrate to you to-night. In constructing the apparatus the idea was to make it as simple and as safe as possible. (Figs. 2–4.) *A* is the tube leading from the pressure pump *b*. At *c* is a three-way stopcock with a dial marked Ether, Ether-Air, Air. *D* is the ether-containing bottle which can be unscrewed at *g* and *h* for cleaning purposes. At *e* is another stopcock to cut off the ether. At *j* is a special inlet for the attachment of an oxygen tank, *i* represents an air filter and *k* the tube leading to the intratracheal canula, *l* represents a mercury manometer. If we want to supply ether alone the stopcock at *e* is opened and the handle of the three-way stopcock at *e* is turned pointing to ether. The air is thus pumped into the ether bottle and the ether vapors travel in the direction of the arrows to the intratracheal canula. If the handle at *c* points to Air-Ether a part of the air passes through the ether bottle, the other part passes directly to the lung of the patient. If only air is supplied the handle at *c* is turned to Air and the stopcock *e* is closed, thus shutting off the ether bottle entirely from the air-circuit.

The working of the apparatus is extremely simple. The only thing to remember is to open stopcock *e* before we turn the stopcock at *c* to Ether. One word in conclusion about the technique of intubation.

The size of the intratracheal tube I judge from the diameter of the trachea at the suprasternal notch of the patient. This can be measured best with a pair of calipers. A tube corresponding to three-fourths of the measure taken should be selected. The tube should be of fairly stiff material, preferably with the hole at the end although this latter is not absolutely necessary.

In the human being the introduction of a soft tube is not as easy as in the dog, where, by pulling the tongue forward, we can bring the glottis into full view. This, however, we cannot do in man. Furthermore, I think one should try, if possible, not to touch the mucous membrane of the mouth with the tip of the tube and soil it with the infectious buccal secretions. This would best be done if we could introduce the tube under guidance of the eye.

For this purpose I have constructed with the skillful aid of Mr. Reinhold Wappler an instrument which in principle is similar to the direct-vision laryngoscope of Hayes. To the shaft of the instrument is attached by a clamp a tube of suitable caliber, bent at a proper angle through which is guided the intubation tube. (Three sizes of metal tubes come with the instrument.) The picture seen with this instrument is upright and not a mirror picture. At the same time the visual field is larger than in the original Hayes instrument. (Fig. 5.)

The technique of intubation is comparatively simple. After the patient is deeply narcotized, the mouth is opened wide and held open by a mouthgag. The head is brought forward, an assistant pulls the tongue out, the instrument armed with the intubation tube is put into the mouth. The entrance of the larynx is now brought into view. In arming the instrument with the intubation tube care must be taken not to have the tip of the tube project out of the metal guide, in order to avoid soiling it with the secretions of the mouth. I deem this point of importance in order to lessen the danger of infecting the air passages and the lung with this sometimes highly infectious material. After the entrance of the larynx is brought into view, the intubation tube is gently thrust forward until it is seen to pass over the epiglottis into the larynx. The tube now being well in the trachea, the metal guide is released from the instrument and is withdrawn over the end of the tube out of the mouth. In intubating the following points must be remembered:

1. Bring the head well forward and pull the tongue well out.

2. Remove mucus if there is any from the pharynx.

3. Keep the instrument well in the median line.

While I was preparing this paper, Dr. Elsberg's article appeared in the Annals of Surgery, February, 1911. He used the Meltzer-Auer method as a means of anæsthesia and as I gather from his article, with perfect safety to the patient. He says: "I have carefully watched the patients when they have awakened from the anæsthesia. None had any cough or expectoration at any time and none had any pulmonary complication of even the mildest kind after the operation." He also advises intubation under guidance of the eye and uses for this purpose a bronchoscopic tube with equally good results.

ANÆSTHESIA BY INTRATRACHEAL INSUFFLATION[1]

Advances in Technique; A Practicable Tube-introducer; Nitrous Oxide-oxygen as the Anæsthetic

By FREDERIC J. COTTON, A. M., M. D., and WALTER M. BOOTHBY, A. M., M. D.,
Boston, Massachusetts

MELTZER and Auer demonstrated the possibility of intratracheal insufflation anæsthesia and certain factors of safety in its use, but the technical difficulties of intubing the trachea have prevented its application in all but the most enthusiastic hands.

If we employ the ingenious but complicated methods of Chevalier Jackson et al., we must perforce abandon the method save in exceptional cases. This would be a pity, for the method has obvious advantages in chest surgery, in surgery of the nose, mouth, and throat, and *probably* in that portion of abdominal surgery that has its field close under the diaphragm, namely, surgery of the stomach, duodenum, and biliary tracts.

One of us (B.) at the time of Meltzer and Auer's report, was engaged with Dr. Albert Ehrenfried at the Harvard Medical School in experiments on the plastic surgery of the abdominal and thoracic aorta.

Numerous experiments were carried out with intratracheal air-ether anæsthesia, with the result that sudden deaths on the table (formerly common in this class of experiment) entirely disappeared.

The apparatus used in the laboratory was a "pick-up" apparatus, though efficient.

Ehrenfried refined this to an apparatus applicable to the human subject, simple but efficient.[2]

This apparatus he tried out in several clinical cases with excellent results; one of us (B.) was associated in this work.

In the earlier cases the Jackson apparatus for introducing the tracheal tube was used, but proved complicated and uncertain, and involved a loss of valuable time in its use.

One of us (C.), until then a spectator, suggested that all this was needless, that an introducer — modeled more or less on the O'Dwyer curves — would do the work. A sketch of this "introducer," made on the spot, was later modified a little (on the data of frozen sections) and Dr. Ehrenfried had the suggested instrument made and used it in a series of cases.

It worked well as a rule, but there was an occasional buckling of the soft rubber tube at the back of the pharynx.

Obviously, this uncertainty could be overcome only by having the catheter run in a tube, in which there could be no buckling.

Such a tube was made and was variously modified by both of us, until we had the instrument here presented.

In general idea, in curve and angle, it nearly follows the O'Dwyer intubing apparatus; in use it is rather different.

When the patient is etherized fully with inhaler or cone, a mouth-gag is inserted, on the patient's left, the tongue is dragged forward sharply with tongue forceps, the operator's left index finger is thrust down till it meets the epiglottis, and the "introducer," held in the right hand, is pushed in and down, alongside the left forefinger, till it has passed the projecting upper edge of the epiglottis. Then the heel of the instrument is pitched upward, and the assistant feeds the catheter into the larynx and trachea.

The first time this instrument was tried, on the first case,[3] the catheter slid comfortably into the trachea, and in cases since it has worked equally well.

Some measure of personal skill is necessary to this introduction no doubt, but it only requires a skill on the part of the surgeon or his assistant equivalent to that required to pass a urethral sound neatly; no more than we may fairly require.

We believe that this instrument with a little practice will enable any competent man to intube the trachea easily.

The trachea once intubed, the rest of intratracheal insufflation anæsthesia is easy, apparently devoid of risk, and advisable in many cases.

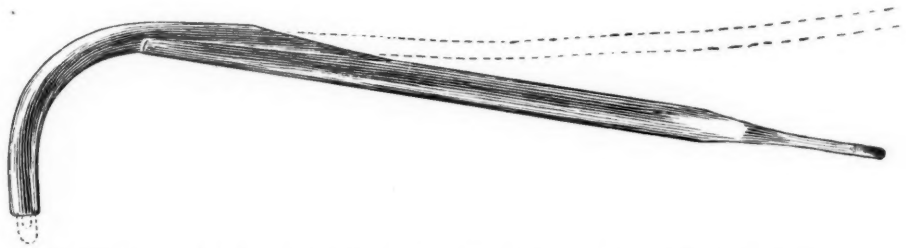
INTRATRACHEAL INSUFFLATION WITH NITROUS OXIDE

The advantages of nitrous oxide (with oxygen) as an anæsthetic are beginning to be recognized, as are those of the intratracheal administration of anæsthetics.

[2] Ehrenfried. Boston Medical and Surgical Journal, vol. clxiv, pp. 532–535.

[3] Boothby Hospital, Boston, July 18, 1911.

[1] Received for publication August 22, 1911.



Introducer (½ actual size); catheter shown in dotted line in position for introduction of the apparatus.

If air and ether are better borne and safer when given intratracheally, it stands to reason that intratracheal administration *should* work well with nitrous-oxide-oxygen anæsthesia.

If oxygenation by gas diffusion without respiration (or with but little respiration) works well with air and ether it should also work well with nitrous oxide and oxygen.

And apparently it does.

The first of our cases, the first anywhere so far as we know, was anæsthetized July 18, 1911.

On July 10, 1911, he had had an ordinary gas-oxygen anæsthesia, under which a colostomy was performed and a specimen secured from the occluding rectal stricture.

This specimen showed a malignant character, and therefore he was anæsthetized again July 18th.

At first nitrous oxide was given with the usual oxygen coefficient till consciousness was lost and anæsthesia was then deepened by the addition of ether till the laryngeal reflex was abolished and then the intratracheal tube was introduced.

No air was used, only nitrous-oxide-oxygen-ether, and presently the ether was cut out, and the greater part of the operation was performed under nitrous oxide and oxygen alone.

At no time was there the slightest trouble. The anæsthesia seemed to differ in no way from the usual air-ether cases. A relative apnœa was quickly established and continued (more or less complete) throughout. The color was good, the skin dry and warm, and the pulse (despite a moderate loss of blood during the rectal excision) continued excellent.

At the end of the operation the patient was "blown out" with pure oxygen as usual. For a minute or two pulse and color continued good, but he did not breathe; then (as the CO_2 began to come to normal) he took up normal breathing again just as the ether intratracheal cases do, though the quiet interval was perhaps longer.

If nitrous oxide-oxygen is better than ether, as many of us believe, and if intratracheal ether is better than ether sucked through a cone, then, logically, there is much to be said for intratracheal gas-oxygen anæsthesia.

At all events we have had the chance to prove it practical and easy.

So far as we know the only gas-oxygen apparatus which it is safe to use for intratracheal work is the one which we have recently devised. For details of this apparatus we refer to our other papers and will here point out only that part concerned with insufflation anæsthesia.

On the apparatus are three stopcocks, one of which shuts off the flow to the breathing bag and mask, the other two when opened run respectively to the intratracheal catheter and to a *mercury safety valve.*

A safety valve is absolutely essential for all forms of intratracheal apparatus and of course especially so when high positive pressures are in the background. The only experimental animal we have seen die from the use of intratracheal insufflation was when we had forgotten to bring our mercury bottle. While the animal was left alone for two minutes spasm of the glottis occurred, and when we saw it the thorax was blown up by the high pressure as tight as a drum and the animal was dead. The valve is simply a bottle of mercury and by means of a T in the air circuit a free end of the tube is introduced 10 mm. into the mercury. It is a large tube, and will easily take care of any possible sudden excess of pressure.

TREATMENT OF PLACENTA PRÆVIA[1]

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NO one who reads the reports of cases of placenta prævia, with which our medical periodicals teem, or who carefully peruses the elaborate expositions devoted to this subject in our best text-books, can fail to be struck with the diversity of views obtaining among medical men, both as regards pathology and treatment. The consequence is that the average practitioner of medicine, when called upon to cope with the difficulties of a case, finds at the bedside that his knowledge is intangible and evanescent. The general practitioner is the one, however, to whose care the larger number of cases of placenta prævia falls, considering the country at large. My remarks are especially intended for his guidance and assistance. In an excellent editorial article in the London Lancet, it is truly said that: "Treatment to be rational must be founded on the pathology and natural history of diseases; in other words, it must take cognizance of the causes of death, with the view to avoiding them, and of the manner in which nature deals with them where she does so successfully." The two dangers that menace the life of every woman the subject of placenta prævia, are, undoubtedly *hæmorrhage* and *sepsis*. How, we may ask, does nature deal with the difficulties of the situation in those rare cases in which she is able to do this. Simply and solely by the extraordinary energy with which the uterus acts, shortening the dangerous period and producing good retraction, which is the only safeguard against bleeding. As the greatest danger lies in the excessive loss of blood, it is of imperative importance to control this within the narrowest limits. The bipolar version, recommended by Braxton Hicks more than fifty years ago, has been widely adopted in practice throughout the world and has been fruitful of good results as we all know. The use of hydrostatic dilators, Charpentier de Ribes' rubber bags, have also come into favor and by many are thought to diminish perceptibly the mortality among the infants. Surgical operative procedures I shall discuss later on. The indication of treatment, to my mind, no matter what particular method be adopted, is to empty the uterus as speedily as is consistent with safety to the mother. Called to a case of placenta prævia during pregnancy, are we justified in temporizing, even if the bleeding has ceased on our arrival? I agree heartily with the advice given by the eminent professor of the University of Glasgow, Dr. J. M. Monro Kerr, in his excellent work on Operative Midwifery, where he says: "Personally I have no sympathy with such a treatment in private practice, for I have repeatedly seen how unsatisfactory, dangerous, and even fatal it may be." If the cervix is not taken up and is not dilatable, the proper course to pursue is to tampon the cervix and the vagina with iodoform gauze. It should be thoroughly done, being very firmly packed. Now, just here let the practitioner bear in mind that important as it is in all obstetrical procedures to carry out the principles of asepsis, in this condition, all offenses against asepsis are fearfully revenged. Before any examination is made the external parts are thoroughly washed with soap and water, the hairs covering the labia majora and the mons veneris should be shaved and then a proper disinfectant used. Moreover, I insist upon it that the obstetrician should wear sterilized rubber gloves in all manipulations of the vagina and uterus. Another point of great importance is to make it a rule to perform no obstetrical operation without first placing the patient upon a proper table. This is an invariable rule with me in private practice. If necessary, I may plead the excuse of Augustine Birrell in descending into such minutiæ for, as he insists, " a string of platitudes, delivered after an oracular manner, arouse attention,

[1] Read by title at the American Gynecological Society meeting, 1911.

without exhausting it, and afford the pleasant sensation of thinking without any of the trouble of thought." After the application of the tampon, the patient lies on her back and an examination is made to determine the presentation of the child; if not normal it is brought into this and fixed by a firmly applied abdominal binder. By such a binder the uterus is forced down upon the pelvis. When the woman is on her back the presenting part of the child exerts a pressure on the lower uterine segment and, consequently, the placenta is pressed against its surface of attachment. This pressure is serviceable, moreover, in evoking uterine contractions. The tampon, if properly applied, may remain untouched for one, two, or even three days, if necessary. The patient will need the use of the catheter, as the urethra is elongated and made impervious. As a rule, however, labor sets in within twelve or twenty-four hours or even within two or three hours. In certain cases the tampon is expelled and the birth immediately follows, owing to the strong uterine contractions. This is, however, a rare event. When the labor is in progress and the cervix is dilated, or dilatable, it is generally recommended that as soon as two fingers can be passed through the cervical canal the membranes should be ruptured and the bipolar version of Braxton Hicks be adopted. I do not recommend this practice. A skilled obstetrician, who had had large experience, may find this method of combined version not very difficult, but the ordinary practitioner may find it hard to turn the child and seize a knee or foot. If you are able to dilate the cervical canal sufficiently to introduce two fingers, it will be found that gradually dilation may be continued manually until the entire hand finds entrance into the uterine cavity, and so internal version may be accomplished very quickly.

By the bipolar version, on the contrary, a long time may be expended in securing one's orientation. As Fritsch (Geburtshilfe) truly says: "As the entire child has to be drawn through the os uteri after a few minutes, the eventual dilatation effected by the entire hand is rather favorable, by being preparative, than faulty." It need scarcely be insisted upon that this manual dilatation should be effected in the most cautious and careful manner. It must be recollected that the rule is that the contractions that cause the bleeding also dilate the cervix, and, hence, careful dilatation manually is usually not difficult nor injurious. It is beyond question that podalic version enables the physician to completely control the situation, the child's breech performing the function of a perfect tampon. If bleeding should ensue, a slight traction on the delivered foot enables you to increase the tampon effect of the breech. Too much emphasis cannot be laid upon this note of warning to be careful, not to force the extraction of the child, when the cervix is not sufficiently dilated. Many a physician by violating this principle has, as Bumm, in his magnificent work, Grundriss zum Studium der Geburtshilfe, admirably says: "lost the mother because he would quickly deliver the dying child." In deep implantation of the placenta even slight lacerations of the cervix bleed profusely on account of the great vascularity of the parts, and the last bleeding may cost the patient her life. In placenta prævia it should therefore be a fundamental principle of guidance, that the expulsion of the child, after podalic version, should be left to the uterine contractions. In the slighter forms of placenta prævia lateralis and marginata, in head presentations, version may often be dispensed with. The artificial rupture of the membranes frequently suffices as the placenta retracts with the lower uterine segment and the descending head tampons the bleeding surface. The delivery then may be accomplished by the forceps. In such circumstances I have repeatedly found that there was little more bleeding than in a normal case. The desire to diminish the frightful child mortality, has led, of recent years, to the introduction of metreuryse, that is, the use of hydrostatic dilators, particularly the rubber bag of Charpentier de Ribes and its modification. In certain cases, as in those in which the child is at full term or near it and the cervix is long and, relatively, rather rigid, metreuryse gives excellent results. Hofmeier (von Winckel Handbuch) calls attention to the fact that

air embolism has been the cause of death in the execution of combined version or after the event, and raises the question whether the liability to this accident may not be increased by the metreurynter. I have no experience which lends countenance to this theory. Hofmeier does not believe that it has been proven that the general application of the metreurynter would render the prognosis, in fact, more favorable for the children. Pfannenstiel (Monatschr. für Geburtsh. u. Gynäk., bd. 29, 5, 265), whose premature death is a great loss to science, used it exclusively in the last days of his life and was enthusiastic in its praise. The advantages claimed for it are that the os uteri and cervix are, relatively, quickly dilated and the vaginal tampon is not required. In the interest of the child still living and is at term, it is especially indicated. The expulsion of the balloon is left to the uterine contractions and, as a rule, version followed by extraction may be employed. I have used the method in hospital as well as private practice with satisfaction, but it is certainly not available for private practice, generally. The life of rubber is short and the general practitioner will hardly be able to supply himself, at frequent intervals, to meet an emergency that may not arise. Nevertheless, in view of the many advantages appertaining to the treatment by the metreurynter, it would be well for the general practitioner to have a set on hand, when possible. A very interesting question has of late been discussed as to whether the rubber bag should be introduced, after rupture of the membranes within the ovum, or be placed with the membranes intact, outside the ovum, next to the uterine wall: in other words, whether it should be intra- or extraovular. Zimmermann (Monat. f. Geb. u. Gyn., bd. xvi, 1909) is an enthusiastic advocate for the extraovular position of the balloon. He states that in private practice he used this method in twenty-eight cases, without the loss of a maternal life. Hauch (Zentralbl. f. Gyn., 1911), on the contrary, believes that the balloon should always be intraovular. In 48 cases treated by the intraovular method, all the patients recovered, whereas in 96 cases, in which the extraovular method was followed, he lost six cases, three from infection. Füth (Zentralblatt f. Gyn., Feb., 1911) treats the subject at some length and calls attention to the fact that in placenta prævia totalis, it occurs now and then, that in passing the finger through the placenta it is impossible to seize and rupture the amnion. For all practicable purposes, however, it has been maintained by others that it is sufficient for the balloon to lie intrachorial, as, in that case, the loosened cotyledons will be pushed against the placenta. He believes the extraovular method applicable in some cases. For my part, I do not recommend this method. Of recent years the Cæsarean section, not only the classical but also the vaginal and extraperitoneal (suprasymphyseal) has been advocated and practiced for the treatment of placenta prævia. Especially in Germany has the subject received a great deal of attention. In such a case as one that I saw a number of years ago, in consultation, which terminated fatally from septic infection, the abdominal Cæsarean section would now be indicated. The woman referred to was an elderly primipara, with a long rigid cervix and a contracted pelvis, a simple flat pelvis. It would also be indicated if the life of the child were of paramount importance and the mother were willing to undergo the operation; the child being alive and at or near term. In a number of cases in which prompt delivery is demanded and the ordinary obstetrical means are not available, I believe the vaginal Cæsarean section is indicated notwithstanding the fact that it is condemned by so many eminent authorities. Dr. Arthur Stein, of this city, has lately reported a case in which he employed this method successfully, which is very instructive. J. Thies, the director of Bumm's Klinik, praises highly the use of the metreurynter and maintains that by the introduction and slight traction on the metreurynter even severe hæmorrhage may be controlled. "Less success," he goes on to remark, "will this method have in primiparæ and women with very rigid portio. In these cases better results for mother and child will be obtained by the vaginal Cæsarean section. If we meet the placenta seated on the anterior

wall, the tearing out of the forceps may be avoided by introducing a metreurynter above the internal os, and so drawing the uterus down and then performing hysterotomia anterior."

The suprasymphyseal Cæsarean section, as Bumm remarks, "has been applied by J. Veit and H. Sellheim with success and been so happily modified by them that it may be preferred to the old Cæsarean section in many cases." I follow the description given by Bumm (Grundriss, etc., für Geburtshilfe). The same transverse incision through skin and fascia is made as Pfannenstiel introduced for gynæcological operations. The section follows the skin fold about the mons veneris, and must be made sufficiently broad. After the fascia is split, the recti muscles are held apart by retractors. The subserous connective tissue then is freely exposed in the lower angle of the wound. The summit of the bladder is perceptible; it is easily recognized by the rich development of venous vessels. If now the bladder is shoved downwards with a swab and the peritoneum upwards, we succeed without difficulty in detaching the peritoneum through the excavatio vesico-uterina from the bladder and without wounding the serosa, we attain above the summit of the bladder to the anterior uterine wall. At times, in order to make free the summit of the bladder, we must have recourse to the scissors, or the serous tissue tears out for a short distance. After attaining to the wall of the lower uterine segment, a sufficiently large piece of the wall may be freed by pushing up the fold of reflection of the peritoneum and by shoving downwards the bladder. The wall of the cervix is then incised in the longitudinal direction and the head forced out by pressure from the sides or delivered by forceps or version. The advantages of the suprasymphyseal Cæsarean section are mainly two, first, the peritoneum is not opened, or possibly transiently to a small extent; peritoneal phenomena of irritation or infection are, therefore, generally excluded. Secondly, the suture of the thin cervical wall may be accomplished much more easily, certainly, and quickly than is the case with the thick wall of the uterine body. The suprasymphyseal Cæsarean section is especially appropriate in the case of parturient women with a narrow pelvis, in whom the dilatation has far advanced and the excavatio vesico-uterina is well drawn up over the advancing head of the child. In pregnant women or during the first part of the stage of dilatation, the discovery and stripping off of the peritoneum of the excavatio vesico-uterina is difficult and can not be accomplished without opening the peritoneum. In the postpartum period, if bleeding should occur in consequence of laceration of the cervix, it is a waste of time to try expectant measures. The vagina must be firmly tamponed with iodoform gauze, and a tight abdominal binder be applied to force the anteflexed uterus against this tampon in the pelvic cavity.

SURGICAL TREATMENT OF FRACTURES OF THE PELVIS

By D. A. K. STEELE, M. D., Chicago, Illinois

FRACTURES of the pelvis are among the most infrequent fractures we are called upon to treat. The ilium, ischium, pubic bones, and sacrum, forming the pelvis, are so firm and strong that they resist all injuries except those of the greatest possible violence. Fractures of these bones are caused by crushing injuries — wheels passing over the pelvis, or by the caving in of the roof of a mine or tunnel, or some great direct violence. The fractures may be single, double, or multiple, and the diagnosis is made in the ordinary way by clinical methods of surgical examination, and perfected by the more scientific method, the skiagram.

We are not so much interested in the treatment of the fracture itself as in the treatment of the complications that are so fatal and likely to follow injuries of this character. Rupture of the urethra, tearing of the prostate or laceration of the bladder or rectum are among those most fatal. In their treatment the first thing is a suitable fracture bed, a firm, strong, comfortable mattress with trap door in the center, so that drainage secretions or bowel movements can be cared for without disturbing the patient. The duration of treatment is from four to six weeks.

The retentive apparatus is of the simplest form — ordinarily the flannel binder or girdle around the pelvis to approximate all movable portions of the fractured bones. Fractures of the upper part of the ilium are simplest, because they are devoid of the ordinary complications and are produced by direct violence, striking the upper margin of the pelvis against a projecting post or wall. The fixation of the small movable portion is best secured by superimposed layers of zinc oxide plaster. Two or three layers are all that is necessary.

Irregular fractures of the pelvis are best retained by the encircling girdle. In all cases of severe fracture of the pelvis the catheter should be introduced to determine whether or not there are injuries to the urethra or prostate. If it is impossible to introduce the catheter, or if the first passage of urine is bloody, it is an indication that there has been a rupture of the urethra or bladder. The modern method of treatment when you have evidence of rupture of the urethra, is to make a primary median incision into the perineal urethra so as to drain the bladder. In cases where there is evidence of peritonitis a laparotomy should be promptly made.

This, in brief, constitutes all I wish to say on this subject of a rather rare group of fractures.

THE REMOVAL OF URETERAL CALCULI FROM THE BLADDER UNDER GUIDANCE OF THE CYSTOSCOPE

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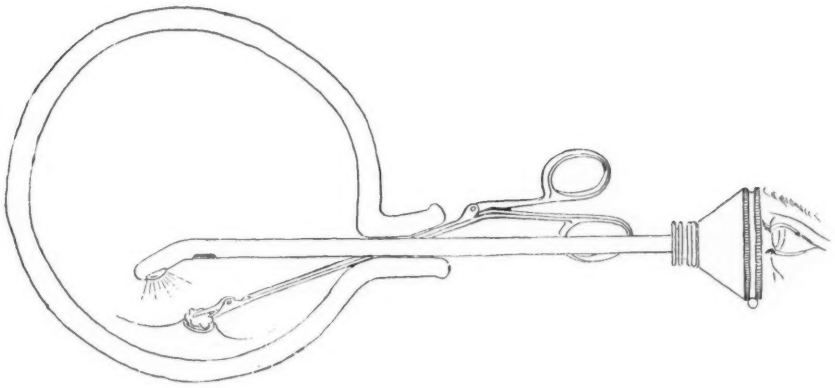
FOR the removal of renal calculi impacted in the ureteral opening and projecting into the bladder, the general surgeon, as a rule, resorts to a major operation (see discussion following Dr. M. F. Porter's paper on "Kidney and Ureteral Stones," Journal A. M. A., 1910, pp. 1695–1697); while the genito-urinary specialist, whose work is chiefly on men, requires a complicated and costly operating cystoscope, the use of which demands a great deal of practice and experience. The gynecologist, on the other hand, has a very much easier task, for the shortness and width of the female urethra enables him to extract stones with ordinary instruments, simply under guidance of an examining cystoscope.

This method will be best illustrated by a brief report of the following case:

On August 12, 1910, a former patient of mine consulted me, because for the past three weeks, she had been troubled with frequent urination, burning sensation in the vulva, and more or less constant pain in her right side. Bimanual examination revealed the right ureter palpable and sensitive to touch, and a cystoscopic examination was suggested for the purpose of determining the exact cause of her discomfort. Three days later, and before she submitted to the proposed examination, she was seized by a typical renal colic. It now appeared that she had gone through a similar attack four years previously and had passed a



stone at that time. The usual treatment brought speedy relief from pain and on August 19, 1910, a cystoscopic examination was made to ascertain whether the stone had slipped into the bladder. The latter, however, was found empty and the mucous membrane was normal with the sole exception of the papilla of the right ureter which was reddened and swollen. The ureteral opening was seen to open and close rhythmically. A catheter was introduced into the ureter but met with an unsurmountable obstacle immediately after entering. The cystoscope was, therefore, withdrawn and a bimanual examination was made which revealed the presence of an oblong concretion in the vesical portion of the right ureter.

This diagnosis was confirmed at once by two X-ray pictures, one of which showed the right kidney to be free, while on the other a stone shadow appeared at the site mapped out by the bimanual examination.

At this stage the stone could have easily been removed through a vaginal incision, but the patient refused operation and disappeared from observation until increased pain and marked difficulty in urinating forced her to return to the office on September 29, 1910. A cystoscopic examination revealed *a concretion lying within the right ureteral opening and protruding into the bladder*. The patient was advised to drink large quantities of water, in the hope that by increased diuresis the stone might be washed into the bladder. A second cystoscopic examination, however, on October 3, 1910, showed that the stone had not changed its position.

A slender alligator forceps, such as used by laryngologists for extracting foreign bodies from the upper air passages, was now introduced into the bladder, alongside of the cystoscope, the latter remaining *in situ*. The accompanying sketch illustrates the procedure in a diagrammatical fashion. The passage of the instrument through the urethra offered no difficulties as the sensibility of both urethra and bladder had been reduced by a preliminary injection of a two per cent alypin solution. The alligator forceps was pushed inward along the stem of the cystoscope until the beak of the forceps appeared in the cystoscopic picture. It was an easy matter to bring the forceps and the stone into the same field of vision, and under guidance of the eye the concretion was now grasped with the forceps and pulled out of the ureteral opening. The cystoscope was then removed first, and the stone delivered through the urethra. During the attempt at obtaining a good hold on the stone three tiny fragments were broken off, which were left behind for spontaneous expulsion. (At a subsequent cystoscopic examination, these fragments were no longer discoverable.)

The entire procedure had taken but a short time, and had been accompanied by very little discomfort on the part of the patient. The stone itself measured ¾ cm. in length. It was of fairly pyramidal shape, the base of which measured a little more than ½ cm. Its surface was uneven, composed as it was of numerous coral-like excrescences.

An epicrisis of this case must first consider the interesting observation that in spite of an impaction of several weeks the function of the kidney had not been impaired seriously. The explanation of this phenomenon lies in the configuration of the stone which, while it lodged immovably within the ureteral papilla with its many irregular excrescences, yet, because of this same irregularity permitted a passage to the urinary flow.

The second point to be made is the ease with which a firmly imbedded stone can be removed without any danger or discomfort to the patient. The credit of having shown us this simple way of

attacking ureteral stones is due to Mirabeau, of Munich, who about ten years ago devised a slender tube to be introduced into the bladder along side the cystoscope. Through this tube he passed his vesical instruments, particularly designed for this purpose, such as forceps, snares, and scissors. The obvious advantage of this method lay in the fact that one could use the ordinary cystoscope which every gynecologist possesses, and in conjunction with, but distinctly separate from it, a set of inexpensive instruments.

For the removal of stones or foreign bodies, this method of Mirabeau can be still further simplified as demonstrated in my case. The laryngological instrument glided into the bladder without difficulty and it may also be stated that to an eye accustomed to cystoscopic pictures there was no difficulty in placing the forceps at a proper angle to the stone and in grasping and extracting the latter. A small quantity of a two to five per cent alypin solution is all that is required to render the procedure practically painless.

To do all this under the constant surveillance of sight, and to speedily relieve the patient without any risk, these are advantages too obvious to require any comment.

THE VALUE OF POSTURE IN AVOIDING VOMITING FOLLOWING ETHER ANÆSTHESIA

By GEORGE CHANDLER, M. D., Kingston, New York

ABOUT five years ago I began setting patients straight up following abdominal section. At first I had them sit up on the second day after the operation, then on the first day, later on as soon as they recovered from ether, and now I have them recover from ether in the straight upright position. Much to my surprise I found that there was practically no vomiting in these cases. I now have every patient, no matter what the condition operated for, recover from ether in an upright sitting position, and almost never have vomiting or nausea. I cannot give you any statistics, but I have done this in several hundred cases and am thoroughly satisfied of this fact.

The nurses in the hospital first noticed that there was no vomiting and called my attention to the matter. I thought, of course, that it was luck or due to careful anæsthesia, but as I often operated on cases in which the anæsthesist was not of the best, or had had very little experience and even under these unfavorable conditions there was no nausea when the patient sat up, I naturally came to the conclusion that it was due to the upright position. On further thought this conclusion seemed obvious for the following reasons: All vomiting is due either to reflex or direct stimulation of the vomiting center. Reflex vomiting is produced by nerve irritation, as tickling the fauces with the finger, or by the sense of smell, and in other ways I need not mention. Direct irritation is produced by certain toxæmias, such as uremia, which produces nausea and vomiting; also certain drugs, for example — apomorphine which cause vomiting by direct irritation of the vomiting center through the blood. Ether is such an irritant, acting as a central emetic. Now, the vomiting center is closely allied to and surrounds the respiratory center, which is situated in the floor of the fourth ventricle in the medulla oblongata. Ether, likewise, is a respiratory stimulant and kills, when it does, through respiratory paralysis. Whenever there is stimulation of a part to activity a certain amount of congestion occurs in that part, and it seemed to me that this congestion of the respiratory center due to the stimulation of the ether, must involve owing to its proximity the vomiting center, hence the nausea and vomiting following ether.

Setting the patient up relieves the congestion

in the medulla oblongata, thus a diminution of irritation to the vomiting center with its attendant relief to the patient. This explanation seems logical to me. If the operation should take an hour or more probably this method would not be efficacious, as there would be a certain paresis of the capillaries of the medulla, by this time, owing to the prolonged stimulation.

Argument has been given me by other physicians against setting patients up, but I cannot see them at all in the face of the following line of thought: It is a known fact that you can walk through any hospital ward and point out the cardiac cases, simply by the fact that they are all propped up in bed. You cannot in fact put a cardiac dyspnoic flat on his back as it is too uncomfortable for him, and nature dictates the raised position. Nature, of course, is the greatest of all physicians, and he who most closely follows Nature and aids her, is the best doctor. Whether or not we believe in evolution we must concede that the arrangement of blood-vessels and viscera in the human species follows that of the lower animals to a wonderful degree. The abdomen is a closed cavity. The pelvis is fixed, the diaphragm, that great muscle of respiration, is movable. When a patient is in a recumbent position, and the viscera follow along the lines of least resistance, they naturally press against the diaphragm, which is movable and by their weight diminish the capacity of the thoracic cavity. Therefore, every inspiration in this position means more work for the patient, as he has the added weight of the viscera to move.

In the sitting posture, this is surely avoided. Again, if the heart is pressed upon by the diaphragm, it cannot expand as well to receive the incoming blood. In the upright position, the mediastinal cavity is therefore enlarged. There is less pressure on the great vessels and from their arrangement there is less kinking of the veins than in a prone position, in fact, if the patient could be put practically on all fours, the blood arrangement and the relief to the diaphragm would be ideal, as it is in the four-footed animal.

Of course, in syncope, lowering of the head is efficacious by temporarily producing a congestion of the head thereby stimulating the higher centers, but syncope following operation is purely symptomatic and due to a weakened action of the heart, therefore, it seems rational to me that the easier you make it for the heart to work the better for the patient.

There are other reasons for setting patients up immediately after an operation, not the least of which is the mental effect on the patient himself. He gets the immediate impression that his condition is not serious, and this as we all know is a great help to recovery. Furthermore, there is but little weakness resulting from a short stay in bed. Gain in strength goes hand in hand with recovery from disease. The first conscious impression, as the patient emerges from the darkness of anæsthesia to the realities of life, is not the agony of vomiting and nausea, but a calm awakening as from an afternoon nap in a chair and a general sense of well being.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF SURGERY

UNDER THE CHARGE OF

FREDERIC A. BESLEY, M. D.

GEORGE E. BEILBY, M. D. — WM. R. CUBBINS, M. D. — AIMÉ PAUL HEINECK, M. D.
J. S. EISENSTAEDT, M. D. — FREDERICK G. DYAS, M. D. — G. T. COURTENAY, M. D.
FRED C. ZAPFFE, M. D. — JAMES F. CHURCHILL, M. D. — B. J. O'NEILL, M. D.
ARTHUR B. EUSTACE, M. D. — JOHN A. WOLFER, M. D. — H. A. POTTS, M. D.

Autoplastic Transplantation of Tendons from the Dorsum of the Hand to Supply Defects of Flexors or Extensors in the Fingers
(Ueber den autoplastischen Ersatz der Streck- und der Beuge-Sehnen der Finger durch entbehrliche Sehnen des Handrueckens). PROF. DR. VON HACKER. *Beitr. zur klin. Chir.*, band 86, heft 2.

How to restore function following the loss of tendons in the hand and fingers, the sequel of infections and injuries, has long occupied the attention of surgeons. No method has yet been devised which has given general satisfaction. Foreign material, such as catgut, silk, or silkworm gut, has been used with very indifferent success to supply defects in the continuity of tendons. The implanted material usually sloughed out, or subsequent adhesions prevented motion. After recovery from septic infections of the hand, pus organisms may remain latent in the tissues for a long time, which should be a reason for not attempting any plastic work too soon.

v. Hacker has devised an autoplastic tendon transplantation to supplant the loss in the continuity of either flexor or extensor tendons in the fingers or hand. For this purpose he uses a piece of tendon derived from the extensors of either thumb, index, or little fingers. The thumb has three extensors, viz., extensor ossis metacarpi pollicis, extensor longus pollicis, and extensor brevis pollicis. The fingers are extended by the extensor communis digitorum, the extensor indicis, and extensor minimi digiti. Now, the extensor brevis pollicis, extensor indicis, or extensor minimi digiti can be severed without impairing function, and are thus available for purposes of transplantation.

v. Hacker reports the case of a young woman in whom the flexor tendons of the middle finger sloughed out following a tendo-vaginitis leaving the finger extended with complete loss of flexion. Two years after the original infection, v. Hacker operated. An incision was made along the ulnar side of the middle finger throughout its entire length, and a flap turned to the radial side. This was done to bring the line of suture away from the tendon. A short longitudinal incision was made on the dorsum of the hand over the base of the first metacarpal bone, and the tendon of the extensor indicis was found and severed. Through a small incision the tendon was exposed at the metacarpo-phalangeal articulation, and pulled out through this opening. With a pair of forceps the tissues between the base of the index and middle finger were tunneled and the detached tendon pulled through to the palmar surface. The free end was attached to the distal phalanx by incising the periosteum and suturing the tendon beneath the flaps. Next, to prevent the occurrence of adhesions, the author surrounded the tendon in the finger with a specially prepared hernial sac. Without some similar intervention, the tendon would inevitably become adherent to its bed, and the operation would fail of result. The finger flap and wounds on the dorsum were sutured, leaving the tendon still inserted to the index finger.

The second stage of the operation was performed two weeks later. The insertion of the extensor indicis was exposed through a small dorsal incision over the head of the first metacarpal bone, and the tendon cut where it joins the first tendon of the extensor communis digitorum. The divided tendon was then pulled through to the palm of the hand by means of a palmar incision. The distal ends of the flexor tendons were sought, and after being loosened were sutured to the transplanted tendon. Serous membrane from a hernial sac was again wrapped around the portion of tendon in the palm. One year after the operation function was almost perfectly restored.

This method of tendon transplantation may be employed in the following cases:

1. Loss of flexor tendons, either in the fingers or palm of the hand.

2. Defects in the continuity of the extensor tendons of the fingers or dorsum of the hand.

Not only can any of the three extensor tendons before mentioned be used for transplantation purposes, but the tendon of the palmaris longus can be utilized in the same manner.

Rehn and Kirschner have shown by their animal experiments that losses in the continuity of both tendon and fascia can be successfully replaced by free transplantation from other animals. Also tendon defects have been bridged by strands of

fascia, taken from the same or other animal. v. Hacker believes however, that in case of bony, fascial, or tendon defects in the human being, the transplanted material should be obtained from the same individual, rather than be heterogenous in its origin. WILLIAM HESSERT.

Organoscopy. BERTRAM M. BERNHEIM. *Annals of Surgery*, June, 1911.

Under this title, Dr. Bernheim discusses the feasibility of the inspection of intra-abdominal and intrathoracic organs, with a cystoscope, or a proctoscope with reflected light. The idea underlying this seems to be the avoidance of a large incision in the abdominal wall. In the case reported, air was used to dilate the abdominal cavity, but no reason was given as to why a sterile fluid should not be used. The author feels that the definite view obtained of both surfaces of the liver, the gall-bladder, and the stomach, is of value.

WM. R. CUBBINS.

The Treatment of Chronic Pancreatitis by Pancreatostomy. A New Operation. GOETHE LINK. *Annals of Surgery*, June, 1911.

Dr. Link reports very fully a case of obscure abdominal disease in which an exploratory laparotomy showed the pancreas to be filled with calculi. After some difficulty, he was able to free the tail of the pancreas and bring it through the transverse meso-colon into the abdominal wound. Here an incision through the gland into the duct of Wirsung exposed large numbers of small faceted calculi. These were removed and a small catheter stitched into the duct to serve as a drain. Around this, the great omentum was stitched as an additional protection. The catheter was drained into a small rubber bag. The patient made an uneventful recovery and has remained well. The amount of pancreatic fluid excreted through this fistula varied widely. At first it was twenty-five ounces, and averaged twenty-four ounces for twenty-four hours. It has gradually decreased in amount until at present not more than one or two ounces are discharged through the fistula. The Doctor attributes this lessening in amount to the fact that the duct is more patent at its entrance to the bowel. No mention is made as to the future treatment of this fistula, or whether it is necessary to cause these fistulæ to be permanent. It is suggested that this pancreatostomy can also be done by bringing the tail of the pancreas out through the gastro-colic omentum. Of particular interest in the symptomatology of this case is the fact that the pain was in the left hypochrondium radiated in a circle around the body and also frequently down in the area of the left ureter. Also that there were no changes of any kind in the stool. WM. R. CUBBINS.

Acute Hepatitis Simulating Stone in the Common Duct and Liver Abscess. JOHN W. CHURCHMAN. *Annals of Surgery*, June, 1911.

Under this title Dr. Churchman reports two cases "of a grave acute disease associated with enlargement of the liver, some increase in the connective tissue elements and a high grade of parenchymatous destruction." The symptoms are those of fever, jaundice, light colored stools, and a severe intoxication. No bacteria could be demonstrated either before or after death. No relief was obtained by draining the gall-bladder which showed no changes. The Wasserman of one case positive with a history of lues and the other case no history of lues and a negative Wasserman reaction. No attempt is made to classify the disease either from the clinical or pathological findings although two names are suggested which are a combination of the clinical and pathologic picture.

The history of hepatic changes both from a clinical and experimental standpoint are very carefully considered and analyzed in the article.

WM. R. CUBBINS.

ABSTRACTS OF CURRENT LITERATURE

DEPARTMENT OF GYNECOLOGY

UNDER THE CHARGE OF

J. CLARENCE WEBSTER, M. D. — E. C. DUDLEY, M. D.
J. C. HOLLISTER, M. D. — GEO. DE TARNOWSKY, M. D.
HELIODOR SCHILLER, M. D. — CAREY CULBERTSON, M. D.

X-Ray Treatment in Gynecology (Die Roentgen Behandlung in der Gynækologie). DR. KELEN. *Monats. f. Geb. u. Gyn.*, bd. xxxiv, h. 2.

The knowledge of exactly measuring and toning down the intensity of X-rays enables us to influence with them deep lying structures and organs. The possibility of increasing their penetrating power widens their therapeutic field, especially their action on deeper lying organs, the "Tiefenbestrahlung." Exact instruments for measuring their intensity and penetrating power are of the greatest help.

The author claims that any gynecologist who hastily judges the gynecological treatment with X-rays has no knowledge regarding their action, nor has he the correct technique or experience. Kelen uses and advises the following technique:

1. Distance of the tube: The tube should be five times as far away from the skin as the organ which ought to be influenced is apart from the skin.

2. Doses: As doses he prefers one large prolonged dose and to avoid cumulative action he advises an intermission of four weeks between the single large doses. To use small doses in short intervals for the sake of precaution is incorrect and by far more risky.

3. Measurement of the X-rays: It is absolutely necessary to know exactly the intensity and penetrating power — quality and quantity — of the X-rays. This he obtains by the use of different and correct working instruments. In general it holds good to use hard tubes; they give deep penetrating rays.

In order to measure the current of the tube a miliamperemeter is in the secondary circuit. This is one of the most necessary instruments. The optimum of the current is obtained if the radiation of heat from the tube and the current used remain well balanced. A higher and even temperature of the tube is necessary for an even radiation, and an even radiation is necessary for a good result. A special tube for therapeutic use is necessary, a tube of maximum hardness.

Experience and results obtained:

1. Thirty-two cases of malignant, inoperable tumors. No cures were obtained but decrease in pain and improvement of the general condition could be observed.

2. As a prophylactic treatment following the operation for a malignant tumor — time too short.

3. For hæmorrhages, dysmenorrhœa and menorrhagia. Here X-rays will be found of help in cases which resist all other treatment, especially cases of profuse and long lasting hæmorrhages, menorrhagias, in which the temporary sterility produced by the rays will be of no harm. In 31 such cases he had good results.

4. To obtain temporary sterility. Good results were obtained in 7 cases — time of observation ten months.

5. Myomata. Nearly every myoma can be reduced by the proper use of X-rays. The myomata of elder persons will respond and shrink more quickly than the myomata of younger individuals. Also the ovaries of persons near the climax will show quicker degenerative changes and more lasting changes than those of younger people. Hæmorrhages in the course of fibroma uteri will soon stop after the proper use of the X-rays. The anæmia is soon improved. Sometimes several months will pass before a marked reduction can be observed. Compared with surgery, he calls the use of the X-rays a slow and harmless remedy, the operation having the advantage of an immediate result and a disadvantage in the high mortality, especially in the very anæmic patients.

The hæmostatic effect of X-rays in myomata is most evident. All erythemas observed were very slight. In women over 40 years with myoma X-rays ought to be tried.

6. X-rays are unsuitable to produce artificial abortus.

7. Good results were obtained in cases of pruritus vulvæ. HELIODOR SCHILLER.

A Contribution to the Knowledge of the So-called "Krukenberg's" Tumor of the Ovary (Ein Beitrag zur Kenntniss der sogenannten "Krukenberg's Tumoren des Ovarium). HUSSY. *Beitr. f. Geb. u. Gyn.*, bd. xvi, h. 3.

A woman, 47 years old, was operated upon in 1906 for carcinoma of the pylorus; the pylorus was resected. In 1910 the menopause commenced,

since which time she noticed an increase in the size of the abdomen. Her condition in February, 1911, was as follows: A well nourished woman, with a large, hard mass in the abdomen, the uterus normal. A probable diagnosis of a tumor of the omentum was made. The abdominal incision revealed a big, solid tumor of the left ovary, which was easily removed. Besides this a supravaginal amputation and right ovarectomy were performed. The microscopical picture proved the tumor to be a metastasis of the primary carcinoma of the stomach. There was no ovarian tissue visible. The absolute absence of metastasis in the peritoneum, omentum, and other organs indicated a propagation of the carcinoma by way of the lymph vessels, and spoke surely against any dissemination of cancer cells and implantation into the ovary.

Of interest in this case is the relative benignity of the tumor and the long time which elasped between the primary and secondary operation.

HELIODOR SCHILLER.

The Martyrdom of the St. Agathe in the 20th Century (Märtyrtum der heiligen Agathe im Zwanzigsten Jahrhundert). BOKELMAN. *Monats. f. Geburt. u. Gyn.*, bd. xxxiii, h. 6.

The author compares Sellheim's advice to extirpate the healthy mamma to cure eclampsia, with the habit of the Romans at the time of the persecution of the believers in Christ, to torture the women by amputating their breasts. To his mind the advice of Sellheim is not based on any scientific premises or on experience, and he advises strongly against it.

HELIODOR SCHILLER.

A Chorio-Angioma with a Distinct Fibrous Capsule (Ein Chorio-angioma mit einer Capsel). HAUSER. *Beitr. f. Geb. u. Gyn.*, bd. xvi, h. 3.

In his monograph on chorio-angioma of the placenta, Grafenberg comes to the conclusion that it is not a neoplasm in the real sense of the word, but a product of disturbances in the blood circulation of the intervillous spaces. This disturbance produces a loss of the epithelial covering of the villi, especially the syncytial cells and their final agglutination, until a picture of a regular angioma is simulated. Hauser who had already taken a position against this theory, gives in this work histological pictures of a second case which proves Grafenberg's theory incorrect, at least for a number of cases.

The placenta was of a II-para. In her first confinement she gave birth to a seven month old macerated fœtus. The present confinement was spontaneous, no hæmorrhages. The baby died 26 days afterward of pemphigus syphiliticus. The placenta was of normal size, without any macroscopically visible syphilitic changes. Near the margin there was a distinct tumor 7½ cm. long, 3 cm. wide, and 2½ cm. thick. The tumor was between cotyledons and more towards the maternal side. It could be easily peeled out from its seat and a distinct capsule noticed. In the hilus of the tumor entered a pedicle, carrying vessels. The tumor was separated from the amnion and chorion by a thin layer of placenta. The surrounding cotyledons were compressed and a cross section showed macroscopically fibrous septa, which carried large vessels. Microscopically there were numerous capillaries, one close to the other, their endothelium protruding into the lumen and between them connective tissue. In the other parts of the tumor the connective tissue prevailed, but in general the angiomatous character was more prominent. The capsule which could easily be stripped off carried on its outside at places remnants of villi. In peeling off the capsule a close connection between it and the fibrous septa, could be seen. There was surely no continuous layer of syncytial cells on the outside of the tumor. Microscopically the capsule showed layers of fibrillary connective tissue. Villi could not be found inside of the capsule and the typical Van Giesen and Mallory stain gave new evidence of the fibrous character of the capsule. These facts proved that there did not exist a transition from the surrounding placenta tissue into the tumor, that the villi could not be looked upon as the matrix of the chorio-angioma, and that Grafenberg's hypothesis of the genesis of these tumors needs correction. The author believes that the tumor is an angioma of an allantois vessel.

HELIODOR SCHILLER.

BOOK REVIEWS

THE PRINCIPLES OF GYNECOLOGY. By W. Blair Bell, B. S., M. D. (Lon.) London: Longmans, Green & Company, 1910.

In the preface to this new addition to gynecological texts the author frankly speaks of his volume as a short one, making no claim to the production of a complete treatise which, at this period in medical literature, would of a necessity be a monumental compilation. On the contrary, his aim has been to teach the subject scientifically, though simply, casting aside the older method of gynecological compilation as "time worn and too long honoured," in order to adapt a simple and more logical arrangement, making for lucidity as well as for more consecutive reading. While this aim is gained with a certain advantage, elementary principles are lost sight of in many instances, to the detriment of the untrained reader.

The evolution and development of the genital organs and their anatomy and physiology occupy the first two chapters, their histological structure being unusually well explained and illustrated for a general text. Menstruation and conception are described briefly, though many of the various theories involved are not mentioned, and their respective relations to gynecology is not set forth clearly. In the chapter on examination the Sims position is preferred for vaginal inspection, as is the genufacial for cystoscopy, as it is also later advised for rectal examination.

Congenital malformations and injuries to the perineum and cervix are treated in a conventional manner, as are dislocations of the uterus and appendages. Considerable space, relatively, is given to consideration of the pessary. The Gilliam suspension operation is preferred in most forms of uterine descent, though other methods are mentioned and advised in certain conditions. Inversion of the uterus is treated at considerable length.

In amenorrhœa, dysmenorrhœa, and menorrhagia, the curette is used rather freely and calcium lactato frequently prescribed. This form of calcium is also advised in subinvolution, the author considering calcium deficiency one of the common causes of this condition. The subjects of abortion and ectopic pregnancy are handled briefly, but to the point, the tendency being towards radical rather than conservative treatment.

Considerable space is given to the consideration of gonorrhœa and syphilis. Prophylactically he says, "until medical men engage more freely in municipal and parliamentary life we can not hope for the legislation which is necessary to stamp out venereal diseases. To the medical man who understands and appreciates the ravages wrought, and the misery entailed by gonorrhœa and syphilis, it seems incredible that intelligent men can foregather and legislate concerning infective and contagious diseases and do no more than fly the kite of lofty morals over the venereal infections that undermine the physique and happiness of a large proportion of the race. To the surgeon falls only the lot of offering advice which may or may not be accepted."

Brief consideration, on the other hand, is given to broad ligament and ovarian cysts, most space being given to diagnosis and classification, with treatment summed up in a paragraph.

It is of interest to observe how Bell handles the subject of endometritis. As such, indeed, he offers no classification but merely refers to "so-called endometritis" in treating of some old pathological friends. Thus in the chapter devoted to gonorrhœa he refers very properly to an involvement of the endometrium alone in the acute stage or associated with inflammation of the entire organ in the chronic stage. Again, under benign growths of the uterus he treats but localized adenomata (erosins and polypi) and diffuse adenomata, this latter as "the disease long described under the name endometritis." Here are found two varieties, the hyperplastic and the hypertrophic, and this is as near as the author approaches to the old classification. Such a logical and able effort towards a new classification is somewhat marred, however, when we find that, under treatment, curettement is yet the thing, still surviving as an operation *per se*, with this author.

The author's position in the treatment of fibromyomata uteri is thus succinctly set forth: "it can hardly be considered superfluous to reiterate the importance of the fact that fibromyomata are rarely harmless even if uncomplicated when first discovered and that serious consideration should always be given at the earliest possible date to the question of operative interference." No fairer or more adequate summing up of the subject has been given expression.

Again in considering ovarian tumors and pregnancy the author says, "any ovarian tumor discovered during pregnancy, unless it be a very small cyst, should be immediately excised. Pregnancy at any rate after the first few weeks of gestation is almost certain to proceed uninterruptedly even if both ovaries be affected and removed."

While in entire agreement with the above opinions we are correspondingly disappointed to find no mention of relationship between the psychoses and neuroses and relaxation of the abdominal wall. In the chapter devoted to allied morbid conditions,

neuroses dependent on, and independent of, the genital functions is most ably discussed, indeed with breadth of vision that is rarely seen in a work of this nature, yet the influence of loss of support to the abdominal viscera in neurasthenia is so constantly felt that to find mention of it missing in this particular volume is surprising.

The chapters devoted to the technical side of surgery are admirably handled, especial attention being given to after treatment and the postoperative complications. We doubt if the author's ring retractors for the laparotomy wound will ever be universally adopted, but it were impossible that no differences of opinion should be brought out to-day in a gynecological work. Altogether, Dr. Bell's contribution to this group of text-books is excellently presented. We might fairly wish that in treatment it were less scanty — at the risk of a few more pages we would thus enjoy a somewhat fuller description of the admirable treatment often little more than hinted at. The book can be recommended confidently to all in the medical profession, students, practitioners, and specialists. The imprint is a credit to the publishers and the illustrations are abundant and definite in fulfilling their function.

CAREY CULBERTSON.

SURGERY: ITS PRINCIPLES AND PRACTICE. Volume V. Edited by W. W. Keen, M. D. Philadelphia and London: W. B. Saunders Company.

With the issuance of the fifth volume of this series is completed one of the most satisfactory of the "systems" of surgery for the general use of practitioners and students that have recently been placed on the market. Such a system must be coextensive with the wide field of surgery and yet balance the various departments with a nice discrimination of their relative importance. It must be made up of contributions of numerous authors, many of whom can only be known to the managing editor by reputation. In presenting the latest views on the subject, the work of previous years must constantly be made use of, and yet in such a way as to give the non-specialist, whose sense of discrimination has not been developed, a proper idea of relative values. Merely to present a mass of material without competent editing, to present the old and discarded with the new and accepted without making clear their relative positions, would have confused the student rather than instructed. The volumes are relatively free from this source of error. There is little "padding" with old illustrations and antiquated material.

Taking the five volumes of "Keen's Surgery" as a whole, one is struck by the freedom of its pages from grossly antiquated illustrations and descriptions of discarded methods, theories, etc. The material has been thoroughly culled and weeded out. In previous numbers of this journal the first four volumes of the series have been reviewed. The fifth and last volume, completing the system, is as satisfying as were the others. Bringing in some of the odd ends of the work, it necessarily lacks the cohesiveness and balance which characterized the previous volumes, but the various chapters are of high character. Volume Five is made up of 18 chapters, covering as many subjects. Chapter lxx, the first of volume five, treats of the "Surgery of the Vascular System," and is written by Rudolph Matas. It covers 334 pages, over one-fourth of the entire volume, and is one of the most complete monographs on vascular surgery with which we are acquainted. Authoritative, comprehensive, well illustrated, it leaves nothing to be desired, and forms one of the most satisfying chapters of the system.

Quite in contrast with this chapter as regards size is that on the "Surgery of the Parathyroid Bodies," by C. H. Mayo. But sixteen pages in length, it is solid, valuable material, based upon his own extensive experience with the surgery of the thyroid, with a splendid résumé of the clinical and experimental literature of the subject. In its small compass it contains a wealth of material, ending with a very full bibliography.

"The Intracranial Surgery of the Fifth (Trigeminal) and the Eighth (Auditory) Nerves," by Charles H. Frazier is based on an extensive personal experience (the author refers to an experience of twenty-eight Gasserian ganglion operations), is one of the best of the volume.

BOOKS RECEIVED

JOINT TUBERCULOSIS. Leonard W. Ely, M. D. New York: William Wood & Co., 1911.

VAGINAL CELIOTOMY. S. Wyllis Bandler, M. D. Philadelphia and London: W. B. Saunders Co., 1911.

A MANUAL OF SURGERY. Francis T. Stewart, M. D. Second edition. Philadelphia: P. Blakiston's Son & Co., 1911.

HANDBOOK OF SUGGESTIVE THERAPEUTICS. Henry S. Munro, M. D. Third edition. St. Louis: C. V. Mosby Company, 1911.

SURGICAL AFTER TREATMENT. L. R. G. Crandon, M. D. Philadelphia and London: W. B. Saunders Company, 1911.

PRACTICAL CYSTOSCOPY. Paul M. Pilcher, M. D. Philadelphia and London: W. B. Saunders Co., 1911.

PHYSIOLOGY AND PATHOLOGY OF THE SEMICIRCULAR CANALS. Adolph E. Ibershoff, M. D. New York: Paul B. Hoeber, 1910.

CLINICAL CONGRESS OF SURGEONS OF NORTH AMERICA

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BARTON COOKE HIRST, M. D.
JOHN B. ROBERTS, M. D.

EVENING LITERARY SESSIONS

Wednesday, November 8th

PHILADELPHIA COUNTY MEDICAL SOCIETY — In Egyptian Hall, Wanamaker Building, at 8:15 P. M.

SURGERY OF THE UPPER ABDOMEN

1. Surgical Pathology of the Stomach and Duodenum J. F. BINNIE, M. D., Kansas City, Missouri.
   Discussion opened by W. L. RODMAN, M. D., Philadelphia.
2. Surgery of the Liver and Bile Ducts . . . GEORGE EMERSON BREWER, M. D., New York City.
   Discussion opened by ROBERT G. LECONTE, M. D., Philadelphia.
3. Surgery of the Pancreas . . . . . MAURICE H. RICHARDSON, M. D., Boston.
   Discussion opened by JOHN B. DEAVER, M. D., Philadelphia.

Thursday, November 9th

PRESIDENTIAL MEETING — In the Ball Room of the Bellevue-Stratford, at 8:15 P. M.

President's Address: Co-ordination of Undergraduate and Postgraduate Teaching of Clinical Surgery . . . . . ALBERT J. OCHSNER, M. D., Chicago

The Technique and Remote Results of Blood-vessel Anastomoses (Lantern Demonstration) . . . . . ALEXIS CARREL, M. D., New York City

Cancer of the Stomach; Its Surgical Cure (Lantern Demonstration) . . . . . WILLIAM J. MAYO, M. D., Rochester, Minn

Friday, November 10th

PHILADELPHIA NEUROLOGICAL SOCIETY — In Mitchell Hall, College of Physicians, at 8:15 P. M.

The Technique and Results of Deep Injections of Alcohol for Ticdouloureux . . . . . HUGH T. PATRICK, M. D., Chicago.
Discussion to be opened by F. X. DERCUM, M. D., Philadelphia.

Some Clinical Types of Disordered Function of the Pituitary Body HARVEY CUSHING, M. D., Baltimore.
Discussion to be opened by S. J. MIXTER, M.D., Boston.

Operative Treatment of Experimental Lesion of the Spinal Cord Equivalent to the Crush Injury of Fracture Dislocation of the Spinal Column . . ALFRED REGINALD ALLEN, M. D., Philadelphia.
Discussion to be opened by CHARLES H. FRAZIER, M. D., Philadelphia.

Monday, November 13th

PHILADELPHIA ACADEMY OF SURGERY — In Mitchell Hall, College of Physicians, at 8:15 P. M.

Some Observations on the Thyroid Gland and Its Diseases (Lantern Demonstration) . . . . . CHARLES H. MAYO, M. D., Rochester, Minn.
Discussion to be opened by FRANCIS J. SHEPHERD, M. D., Montreal, Quebec.

The Operative Treatment of Fractures . . . . . JOSEPH A. BLAKE, M. D., New York City.
Discussion to be opened by EDWARD MARTIN, M. D., Philadelphia.

The Significance of Blood in the Stools . . . . . J. M. T. FINNEY, M. D., Baltimore.
Discussion to be opened by MAURICE H. RICHARDSON, M. D., Boston, Mass.

Tuesday, November 14th

PEDIATRIC SOCIETY OF PHILADELPHIA — In Mitchell Hall, College of Physicians, at 8:15 P. M.

THE SURGERY OF CHILDHOOD

1. Pyloric Stenosis in Infancy, its Surgical Treatment (Lantern Demonstration) . . . . . CHARLES L. SCUDDER, M. D., Boston.
Discussion to be opened by JOHN B. DEAVER, M. D., and EDWARD B. HODGE, M. D., Philadelphia.

2. Some Differences between the Surgery of Children and Adults (Lantern Demonstration) . . . . . CHARLES N. DOWD, M. D., New York City.
Discussion to be opened by HENRY R. WHARTON, M. D., and JOHN H. JOPSON, M. D., Philadelphia.

3. Stereo-Arthrolysis, an Experimental Study; a Preliminary Report . . . . . R. TUNSTALL TAYLOR, M. D., Baltimore.
Discussion to be opened by H. AUGUSTUS WILSON, M. D., and G. G. DAVIS, M. D., Philadelphia.

Wednesday, November 15th

OBSTETRICAL SOCIETY OF PHILADELPHIA — In Mitchell Hall, College of Physicians, at 8:15 P. M.

Surgery of the Tubes and Ovaries . . . . . EDWARD REYNOLDS, M. D., Boston.
Discussion to be opened by J. M. Baldy, M. D., Philadelphia.

The Treatment of Ectopic Gestation . . . . . EDWARD B. CRAGIN, M. D., New York City.

The Circulation of Fibroid Tumors (Lantern Demonstration) JOHN A. SAMPSON, M. D., Albany, N. Y.

COMBINED MEETING OF THE SECTIONS ON OTOLOGY, LARYNGOLOGY AND OPHTHALMOLOGY
In Thompson Hall, College of Physicians, at 8:15 P. M.

The Surgery of the Sinuses and Its Relation to Orbital Complications . . . . . JOSEPH H. BRYAN, M. D., Washington, D. C.

The Relation between Otitic and Intracranial Diseases . . GORHAM BACON, M. D., New York City.

The Newer Operations for Glaucoma . . . . . JOHN E. WEEKS, M. D., New York City.

THE CLINICAL PROGRAM

A SCHEDULE OF EACH DAY'S CLINICAL FEATURES WILL BE BULLETINED AT HEADQUARTERS ON THE AFTERNOON OF THE PRECEDING DAY

UNIVERSITY HOSPITAL

EDWARD MARTIN	Surgical clinic; Nov. 11 and 14, 11 A. M. to 1 P. M.
JOHN G. CLARK	Gynecological clinic; Nov. 8, 4 P. M.; Nov. 10 and 13, 10 to 12 A. M.
CHARLES H. FRAZIER	Surgery of the head; Nov. 7 and 9, 3 P. M.; Nov. 8, 13 and 15, 10 A. M.
GEORGE E. DE SCHWEINITZ	Ophthalmological clinic; Nov. 7, 3 P. M.
BARTON COOKE HIRST	Obstetrical clinic; Nov. 8 and 15, 11 A. M. to 1 P. M.
G. G. DAVIS	Orthopedic clinic; Nov. 7, 8, 9 and 10, 11 A. M. to 1 P. M. and 2 to 4 P. M.; Nov. 11, 2 to 4 P. M.
JOHN B. DEAVER	Surgical clinic; Nov. 10, 11 A. M. to 1 P. M.
C. C. NORRIS	Gynecological clinic; Nov. 9, 10 A. M.; Nov. 13, 3 to 4 P. M.
GEO. P. MÜLLER	Surgical clinic; Nov. 8, 13 and 15, 12 A. M.; Nov. 10 and 14, 2 P. M.
T. TURNER THOMAS	Surgical clinic; Nov. 7 and 8, 3 P. M.; Nov. 9, 2 to 4 P. M.; Nov. 7, 10 A. M.
F. E. KEENE and JOHN LAIRD	Gynecological clinic; Nov. 7, 10 to 12 A. M.
C. P. GRAYSON	Nose and throat clinic; Nov. 7, 8, 10 and 13, 2 P. M.
BROOKE M. ANSPACH	Gynecological clinic; Nov. 8, 11 A. M. to 1 P. M.; Nov. 11 and 15, 10 to 12 A. M.
W. R. NICHOLSON	Obstetrical clinic; Nov. 8, 9 A. M.
B. A. THOMAS	Surgical clinic; Nov. 8, 4 P. M.; Nov. 9, 2 P. M.
H. K. PANCOAST	X-ray clinic; Nov. 10, 10 A. M.
E. ELIASON	Fracture clinic; Nov. 11, 10 A. M.
ALFRED STENGEL, ALFRED C. WOOD and EDWARD MARTIN	Splenectomy as a prophylactic measure (operations); Nov. 9, 10 A. M.
ALEX A. UHLE	Genito-urinary clinic; Nov. 8, 9 and 13, 2 P. M.
JOHN C. MUSSER	Border-line cases; Nov. 8.
J. B. CARNETT	Surgical clinic; Nov. 9, 9 A. M.
JOHN C. HIRST	Obstetrical clinic; Nov. 9, 10 to 12 A. M.
A. D. WHITING	Surgical clinic; Nov. 9 and 14, 3 P. M.
GEORGE E. DE SCHWEINITZ and JOHN D. CARPENTER	Surgery of the eye, Nov. 10, 3 P. M.
F. E. KEENE	Gynecological clinic; Nov. 10, 3 P. M.; Nov. 14, 10 A. M.
ALFRED C. WOOD	Surgical clinic; Nov. 10, 3P. M.
GEORGE G. ROSS	Fracture clinic; Nov. 11 and 15, 3 P. M.
J. E. SWEET	Surgical clinic; Nov. 11, 10 A. M.; Nov. 11 and 13, 4 P. M.
JOHN LAIRD	Genito-urinary clinic; Nov. 7, 2 P. M.
M. H. CRYER	Surgical clinic; Nov. 7 and 11, 2 P. M.
DAMON B. PFEIFFER	Surgical clinic; Nov. 8, 11 A. M.; Nov. 13, 12 M.
THOMAS R. NIELSON	Genito-urinary clinic; Nov. 10, 2 P. M.
W. JACKSON MERRILL	Orthopedic clinic; Nov. 13 and 15, 11 A. M. to 1 P. M.; and 2 P. M.
FORREST P. WILLARD	Fracture clinic; Nov. 11, 9 A. M.
JOHN SPEESE	Surgical pathology of mammary cysts and tumors; Nov. 8, 2 P. M.
ALONZO E. TAYLOR	Anæsthesia and acidosis, Nov. 8.
T. B. HOLLOWAY, CARL WILLIAMS and H. M. LANGDON	Ophthalmological clinic; Nov. 9, 4 to 6 P. M.
E. H. SITER	Genito-urinary clinic; Nov. 11, 2 P. M.
B. A. RANDALL	Cranial surgery; Nov. 13 and 15, 2 P. M.
ROBERT H. IVY	Surgical clinic; Nov. 13, 2 P. M.
DR. EISENBREY	Problems in experimental surgery; Nov. 13, 2 P. M.
R. TAIT MCKENZIE	Treatment of flat foot, round shoulders, lateral curvature or hernia by exercise; Nov. 13, 3 P. M.
BENJAMIN PARRISH	Otological clinic; Nov. 13, 4 P. M.
P. G. SKILLERN, JR.	Salivary (parotid) fistula; Nov. 14, 11 A. M.
GEORGE FETTEROLF	Clinical anatomy of the thorax; Nov. 14, 2 P. M.
RALPH BUTLER	Otological clinic; Nov. 14, 3 P. M.

POLYCLINIC HOSPITAL

B. F. Baer	Gynecological clinic. Nov. 7 and 14, 2 P. M.
L. H. Adler	Rectal clinic. Nov. 7, 1 P. M.; Nov. 13, 2 P. M.
J. M. Baldy	Gynecological clinic. Nov. 7, 9, 14, and 16, 9 to 11 A. M.
John B. Roberts	Surgical clinic. Demonstration of plastic operations on cadaver (laboratory). Plastic surgery of the face, exhibiting operations and results. Nov. 9 and 16, 11 A. M.
J. B. Roberts and L. W. Steinbach	Surgical clinic. Nov. 11, 11 A. M.
F. R. Packard	Nose and throat clinic. Operations on the accessary sinuses. Demonstration in tracheobronchoscopy. Nov. 8, 3 P. M.
G. M. Dorrance and N. Ginsberg	Demonstration of transfusion methods (laboratory). Nov. 10, 10 A. M.
G. M. Dorrance	Demonstrations in operative gynecology (laboratory). Nov. 10, 3 P. M.; Nov. 16, 1 P. M.
R. Butler	Demonstration in operative surgery of the ear and mastoid (laboratory). Nov. 8, 4 P. M.; Nov. 15, 3 P. M.
W. Reber	Ophthalmological clinic. Nov. 8, 1 P. M.
E. L. Vansant	Nose and throat clinic. Submucous operations for deviation of the nasal septum. Nov. 8 and 15, 12 M.
J. A. Kelly	Demonstration in surgical pathology. Nov. 9, 1 P. M.; Nov. 13, 12 M.
J. F. Schamberg	Dermatological clinic. Exhibition of cases of lupus and skin cancer treated by X-ray and other methods. Treatment of angiomata and other nævi by solid carbon dioxide. Nov. 7 and 11, 12 M.
A. Hewson	Demonstration in regional and surgical anatomy. Nov. 7, 3 P. M.; Nov. 14, 12 M.
L. W. Steinbach	Surgical clinic. Surgery of the thyroid gland. Nov. 7 and 14, 11 A. M.
J. H. Jopson and J. Speese	Surgical clinic. Treatment of pulmonary tuberculosis by nitrogen injections. Nov. 8, 11 A. M.
J. H. Jopson	Surgical clinic. Nov. 15, 11 A. M.
C. L. Leonard	Demonstration in X-ray laboratory. Rapid stereoroentgenology. Nov. 7, 4 P. M.; Nov. 11, 1 P. M.; Nov. 14, 3 P. M.
A. A. Sargent	Demonstration in refraction. Nov. 7 and 14, 10 A. M.
W. Roberts	Aural clinic. Nov. 8 and 15, 2 P. M.; Nov. 13, 1 P. M.
William R. Nicholson	Gynecological clinic. Cystoscopy and ureteral catheterization. Nov. 8, 11, and 15, 10 A. M.
M. B. Miller	Surgical clinic. Hernia. Demonstration in operative surgery. Methods of intestinal anastomosis (laboratory). Nov. 10 and 13, 11 A. M.
J. K. Young	Orthopedic clinic. Diagnosis and treatment of infectious arthritis. Tendon transplantation for infantile paralysis; Lange's operation. Nov. 9 and 16, 2 P. M.
A. W. Watson	Nose and throat clinic. Nov. 9 and 16, 3 P. M.
W. M. Sweet	Ophthalmological clinic. Ocular injuries by foreign bodies. Nov. 10, 1 P. M.
W. M. Sweet and C. R. Heed	Demonstration in operative ophthalmology (laboratory). Nov. 11, 4 P. M.; Nov. 15, 1 P. M.
J. P. Tunis	Demonstration in operative surgery of throat and nose (laboratory). Nov. 11, 3 P. M.; Nov. 16, 4 P. M.
B. A. Thomas	Genito-urinary clinic. Chromoureteroscopy, demonstrating carmine test. Intravenous use of salvarsan. Functional kidney diagnosis by the Duboscq colorimeter. The Wasserman technique. Nov. 10 and 14, 4 P. M.
W. C. Posey	Ophthalmological clinic. Nov. 9, 4 P. M.
M. B. Miller, R. M. Goepp and J. A. Kelly	Arteritis obliterans. Exhibition of patients and specimens. Nov. 10, 12 M.
J. Thorington	Refraction. Nov. 10, 2 P. M.
G. M. Coates	Aural clinic. Nov. 11, 2 P. M.
J. S. Gibb	Nose and throat clinic. Tonsillectomy by modern methods. Nov. 13, 3 P. M.
G. H. Makuen	Faulty operations on the tonsils, and their effect on the soft palate and the voice. Nov. 13, 4 P. M.
T. Erck	Gynecological clinic. Nov. 14, 1 P. M.

PENNSYLVANIA HOSPITAL

W. E. Lee	Surgical technique of the hospital. Surgery of the peritoneum; acute, localized, and diffuse inflammations; tubercular peritonitis. Cystoscopic examinations. Fractures and dislocations. Nov. 7, 13, and 15, 10 A. M.; Nov. 13, 3 to 4 P. M.
Robert G. Le Conte	Tubercular glands of the neck; goiter. Surgery of the female perineum. Acute inflammations of bone. Nov. 7, 11 to 1; Nov. 11, 12 to 1; Nov. 16, 11:30 to 1.
Drs. Packard and Coates	Surgery of the ear, nose and throat. Nov. 7, 2 to 4.
Francis A. Packard	Surgical diseases of the ear. Nov. 15, 2 to 4.
W. T. Longcope	Surgical pathology. Nov. 8, 10 A. M.
John H. Gibbon	Hernia; inguinal, femoral, umbilical. Malignant diseases; tumors of the breast. Surgery of the kidney, ureter and bladder. Nov. 8, 11 to 1; Nov. 13, 11:30 to 1; Nov. 15, 11 to 1.
Drs. Schwenk and Shoemaker	Surgery of the eye. Nov. 8 and 13, 2 P. M.
Drs. Allen and Ashhurst	Fractures and dislocations. Nov. 9 and 10, 10 A. M.
Edward B. Hodge	Traumatic surgery of the lung. Club foot and tendon transplantation. Nov. 9, 11:30 to 1; Nov. 16, 10 to 11:30.
Francis T. Stewart	Surgery of the heart and pericardium; thoracic aneurysm. Surgery of blood-vessels. Nov. 9, 2 to 4; Nov. 14, 11:30 to 1.
Arthur E. Billings	Surgery of the female pelvis. Nov. 10, 11:30 to 1.
Drs. Eves and Scarlet	Surgery of the ear, nose and throat. Nov. 10, 2 to 4.
Charles F. Mitchell	Surgery of the intestine; typhoid perforations. Surgery of the upper abdomen. Nov. 11 and 14, 10 A. M.
Charles N. Davis	Surgical diseases of the skin. Nov. 14, 2 to 4.

PHILADELPHIA GENERAL HOSPITAL

Wilmer Krusen	Obstetrical clinic; November 7, 11 to 1 P. M.
H. M. Christian	Genito-urinary clinic; Nov. 7, 2 to 4 P. M.
Walter Roberts	Laryngological clinic; Nov. 7, 4 to 6 P. M.
H. A. Wilson	Orthopedic clinic; Nov. 8 and 10, 9 to 11 A. M.
Joseph W. Hearn	Surgical clinic; Nov. 8 and 15, 11 to 1 P. M.
E. H. Siter	Genito-urinary clinic; Nov. 8, 2 to 4 P. M.
George E. de Schweinitz and E. A. Shumway	Eye clinic; Nov. 8 and 15, 4 to 6 P. M.
J. B. Carnett	Surgical clinic; Nov. 9, 9 to 11 A. M.
W. J. Roe	Oral surgery clinic; Nov. 9 and 16, 11 to 1 P. M.
M. B. Hartzell	Dermatological clinic; Nov. 9, 2 to 4 P. M.
Ernest Laplace	Surgical clinic; Nov. 9, 4 to 6 P. M.
George P. Muller	Surgical clinic; Nov. 10, 9 to 11 A. M.
Frank D. Dickson	Orthopedic clinic; Nov. 10, 11 to 1 P. M.
E. P. Davis	Gynecological and Obstetrical clinic; Nov. 10, 2 to 4 P. M.
J. C. Knipe	Eye clinic; Nov. 10, 4 to 6 P. M.
Henry Tucker	Genito-urinary clinic; Nov. 11, 9 to 11 A. M.
L. W. Steinbach	Surgical clinic; Nov. 11, 11 to 1 P. M.
M. P. Warmuth	Surgical clinic; Nov. 11, 2 to 4 P. M.
W. M. Sweet	Eye clinic; Nov. 11, 4 to 6 P. M.
William L. Rodman	Surgical clinic; Nov. 13, 9 to 11 A. M.
M. H. Cryer	Oral surgery clinic; Nov. 13, 11 to 1 P. M.
M. B. Miller	Surgical clinic; Nov. 13, 2 to 4 P. M.
B. M. Anspach	Gynecological clinic; Nov. 13, 4 to 6 P. M.
T. T. Thomas	Surgical clinic; Nov. 14, 9 to 11 A. M.
Ella B. Everitt	Obstetrical clinic; Nov. 14, 11 to 1 P. M.
H. R. Loux	Surgical clinic; Nov. 14, 2 to 4 P. M.
Alexander Uhle	Genito-urinary clinic; Nov. 14, 4 to 6 P. M.
George M. Boyd	Obstetrical clinic; Nov. 15, 9 to 11 A. M.
R. C. Norris	Obstetrical clinic; Nov. 15, 2 to 4 P. M.
H. K. Gaskill	Dermatological clinic; Nov. 16, 2 to 4 P. M.
Hershey Thomas	Surgical clinic; Nov. 16, 4 to 6 P. M.

JEFFERSON HOSPITAL

Orville Horwitz	Genito-urinary clinic; Nov. 9, 10 A. M.; Nov. 11, 12 M.
H. F. Hansel	Eye clinic; Nov. 8, 9, and 10; 3:30 P. M.
J. Chalmers DaCosta	Surgical clinic; Nov. 8, 10, 13, and 15; 1 P. M.
John H. Gibbon	Surgical clinic; Nov. 7, 11, and 14; 1 to 3 P. M.
H. Augustus Wilson	Orthopedic clinic; Nov. 7, 9, 11, 14, and 16; 10 A. M.
E. E. Montgomery	Gynecological clinic; Nov. 7, 8, 10, 13, 14 and 15, 9 to 11 A. M.
S. MacCuen Smith	Otological clinic; Nov. 8, 10, and 13, 1 P. M.; Nov. 15, 10 A. M.
Edward P. Davis	Obstetrical clinic; daily; 4 to 5 P. M.
D. Braden Kyle	Laryngological clinic; Nov. 9, 11, and 14; 1 P. M.
Willis F. Manges	X-ray clinic; daily; 1 P. M.
Hiram R. Loux	Genito-urinary clinic; Nov. 8 and 10, 12 M.
J. M. Fisher	Gynecological clinic; Nov. 9, 11 and 16, 9 to 11 A. M.

PRESBYTERIAN HOSPITAL

George Strawbridge	Surgery of the eye. Nov. 7, 2 to 4 P. M.
James Thorington	Eye clinic. Nov. 7, 2 to 4 P. M.
W. S. Newcomet	X-ray therapeutics. Nov. 7, 2 to 4 P. M.
John H. Girvin	Gynecological clinic. Nov. 8, 2 to 4 P. M.
H. R. Wharton	Surgical clinic. Nov. 9, 2 to 4 P. M.
George Erety Shoemaker	Gynecological clinic. Nov. 10, 2 to 4 P. M.
D. B. Pfeiffer	Surgical pathology. Nov. 10, 2 to 4 P. M.
O. H. Allis and E. B. Hodge	Surgical clinic. Nov. 11, 2 to 4 P. M.
John H. Jopson	Surgical clinic. Nov. 13, 2 to 4 P. M.
George C. Stout and A. H. Cleveland	Ear, nose and throat clinic (surgical). Nov. 14, 2 to 4 P. M.
Frank C. Knowles	Surgical diseases of the skin. Nov. 14, 2 to 4 P. M.
Richard E. Woods	Gynecological clinic. Nov. 15, 2 to 4 P. M.

SAMARITAN HOSPITAL

Wilmer Krusen	Gynecological clinic. Nov. 8, 11, and 15; 12 M.
Guthrie McConnell	Demonstration of the surgical pathology of malignant tumors. Nov. 8, 2 P. M.
Collier Martin	Rectal clinic. Demonstration of results obtained in the treatment of fistula in ano. Nov. 8 and 15, 3 P. M.
W. Wayne Babcock	Surgical clinic with demonstration of segment anæsthesia by intradural injection. Demonstration of plastic or reconstructive surgery. Nov. 8 and 15, 4 P. M.; Nov. 11, 3 P. M.
Harry G. Duncan	Demonstration of cystoscopy and ureteral catheterization. Nov. 9, 1 P. M.
Nathan G. Ward	Use of high frequency currents and static wave current in the treatment of diseases of nose and throat. Nov. 9, 2 P. M.
Harry Hudson	Orthopedic clinic. Nov. 9, 4 P. M.
William H. Hitschler	Ear, nose and throat clinic. Demonstration of excision of the facial and pharyngeal tonsils. Nov. 10, 3 to 4; Nov. 13, 2:30 P. M.
William E. Robertson	Surgical errors in the diagnosis of intra-abdominal disease. Nov. 10, 4 P. M.
A. Parker Hitchens	Preparation of bacterial vaccines. Application of bacterial vaccines and allied products in surgical therapeutics. Nov. 10, 5 P. M.; Nov. 15, 2 P. M.
C. E. de M. Sajous	The rôle of the ductless glands in relation to surgical therapeutics. Nov. 11, 2 P. M.
William A. Steel	Genito-urinary clinic. Nov. 13, 4 P. M.
J. F. Schamberg	Stereopticon demonstration of syphilis with special reference to the newer therapy. Nov. 13, 5 P. M.
Wendel Reber	Ophthalmic operative clinic. Nov. 14, 3 P. M.

ORTHOPEDIC HOSPITAL

William J. Taylor	Cases of operation for brain tumors; cerebellar cyst. Discussion of laminectomy for Pott's disease; operation for exophthalmic goiter.
Gwilym G. Davis	Operations and demonstrations of cases of bone, joint and paralytic affections.

GYNECEAN HOSPITAL

J. M. BALDY . . . . . Supravaginal hysterectomy with anchorage of the cervix to the round ligaments in connection with plastic operations for uterine prolapse. Suspension of the uterus by posterior attachment of the round ligaments. Hysterectomy for carcinoma of the cervix. Hysterectomy for fibroid tumor of the uterus. Nov. 8 and 13, 10 A. M.

HENRY D. BEYEA . . . . Suspension of the stomach for gastroptosis by plication of the gastrohepatic omentum. Supravaginal resection of the uterus for fibroid tumor, with conservation of a part of the endometrial cavity and the ovaries. Nov. 9, 10 A. M.

THEODORE ERCK . . . . Suspension of the kidney. Hysterectomy for pelvic inflammatory disease. Nov. 10, 10 A. M.

BROOKE M. ANSPACH . . . Cystoscopic examination and catheterization of the ureters. Vesicovaginal interplacement of the uterus for cystocele and prolapse. Resection of excessive fat from the abdominal wall in connection with operation for ventral hernia. Nov. 11, 10 A. M.

GEORGE W. OUTERBRIDGE . Demonstration of interesting gynecological specimens. Nov. 14, 10 A. M. Demonstration of specimens removed at each operation and other specimensbearing on cases of the day, daily.

THE GERMAN HOSPITAL

JOHN B. DEAVER . . . . Surgical clinic; Nov. 8, 9, 11, 13 and 15, 1 to 5 P. M.

A. D. WHITING . . . . . Modern treatment of leg ulcer; Nov. 9, 11, 13 and 15, 10 to 11 A. M.

GEORGE G. ROSS . . . . Unusual fractures; Nov. 9, 11, 13 and 15, 11 to 12 A. M.

ALBERT G. MILLER . . . X-ray demonstrations; Nov. 10 and 14, 12 to 2 P. M.

ALEX A. UHLE . . . . Genito-urinary clinic; Nov. 10, 4 to 6 P. M.

DAMON B. PFEIFFER . . . Gross surgical pathology; Nov. 10 and 14, 3 to 4 P. M.

VINCENT LYON . . . . Surgical bacteriology; Nov. 10 and 14; 4 to 5 P. M.

WILLIAM MACKINNEY . . Genito-urinary clinic; Nov. 13, 4 to 6 P. M.

WOMAN'S HOSPITAL OF PHILADELPHIA

SARAH H. LOCKREY . . . Gynecological clinic; Nov. 7 and 16, 10 A. M.

EMMA E. MUSSON . . . . Yankauer's Eustachian tube work; Nov. 7, 2 P. M. Bronchoscopic and esophageal tube work; Nov. 14, 2 P. M.

CAROLINE M. PURNELL . . Gynecological clinic; Nov. 8 and 15, 10 A. M.

MIRIAM BUTT . . . . . Eye clinic; Nov. 8 and 15, 2 P. M.

KATE W. BALDWIN. . . . Surgical clinic; Nov. 9, 10 A. M. Beeswax in bone cavities and in cavities of the soft tissues; Nov. 11, 2 P. M.

MARY W. GRISCOM. . . . Obstetrical clinic; Nov. 9, 1 P. M.

MARIE K. FORMAD. . . . Panhysterectomy; Nov. 10, 10 A. M. Gynecological clinic; Nov. 14, 10 A. M.

MARGARET F. BUTLER. . . Submucous resection; Nov. 10, 2 P. M. Removal of tonsils and adenoids; Nov. 13, 2 P. M.

CATHARINE MACFARLANE . . Cystoscopy and Bier's hyperemia; Nov. 11, 10 A. M.

FRANCES R. SPRAGUE . . . Surgical clinic; Nov. 13, 10 A. M.

MARY GETTY . . . . . Eye clinic; Nov. 16, 2 P. M.

HOSPITAL OF THE WOMAN'S MEDICAL COLLEGE

ELLA B. EVERITT . . . . Gynecological clinic. Nov. 7, 9, 14, and 16, 1 P. M.

MARGARET F. BUTLER . . Laryngological and rhinological clinic. Nov. 8 and 15, 2 P. M.

HARRY C. DEAVER. . . . Surgical clinic. Nov. 10, 1 P. M.

EMMA E. MUSSON . . . . Aural clinic. Nov. 13, 2 P. M.

CHILDREN'S HOMEOPATHIC HOSPITAL

H. S. WEAVER, F. W. SMITH and OSCAR SEELEY . . . Ear, nose and throat clinics; Nov. 9 and 16, 2:30 to 5.

L. W. THOMPSON . . . . Surgical clinic; Nov. 9 and 16, 2:30 to 5.

ST. LUKE'S HOMEOPATHIC HOSPITAL

D. ROMAN . . . . . Goiter. Nov. 11 and 14, 2:30 to 5.

MEDICO-CHIRURGICAL HOSPITAL

Ernest Laplace	Surgical clinic; Nov. 7 and 11; 11 to 1 P. M.; Nov. 13 and 15; 9 to 11 A. M.
H. M. Christian	Genito-urinary clinic; Nov. 8 and 15; 11 A. M. to 1 P. M.
W. L. Rodman	Surgical clinic; Nov. 8, 10, 14, and 16; 9 to 11 A. M.
J. P. Mann	Orthopedic clinic; Nov. 9 and 14; 11 to 12 A. M.
W. E. Ashton	Gynecological clinic; Nov. 9 and 14; 12:30 to 2 P. M.
L. W. Fox	Eye clinic; Nov. 10 and 13; 1 to 3 P. M.
E. B. Gleason	Otological clinic; Nov. 10 and 15; 3 to 4 P. M.
S. C. Burns	Oral surgical clinic; Nov. 11; 9 to 10 A. M.
G. M. Boyd	Obstetrical clinic; Nov. 13; 12 to 1 P. M.
A. H. Cleveland	Nose and throat clinic; Nov. 16, 12 to 2 P. M.

METHODIST EPISCOPAL HOSPITAL

J. B. Roberts	Surgical clinic. Nov. 7, 12 to 2; Nov. 14, 11 to 2.
Joseph Spellisy	Surgical clinic. Nov. 9 and 16, 11 to 12 A. M.
J. T. Rugh	Orthopedic clinic. Nov. 8, 10, and 13. 11 to 12 A. M.
Walter Roberts	Otological and laryngological clinic. Nov. 9 to 16, 1 to 4 P. M.
L. T. Hammond	Surgical clinic. Nov. 8, 10, and 13, 12 to 2 P. M.
J. P. Moore	Ophthalmological clinic. Nov. 9 and 16, 4 P. M.
R. C. Norris	Gynecological clinic. Nov. 14, 2 P. M.
L. A. Salade	Gynecological clinic. Nov. 13, 2 P. M.

ST. JOSEPH'S HOSPITAL

J. M. Spellisy	Surgical clinic, Nov. 7, 9, and 14; 1 P. M.
M. M. Franklin	Surgical clinic, Nov. 7, 9, and 14; 9 A. M.
C. F. Nassau	Surgical clinic, Nov. 7, 9, and 14; 3 P. M.
E. E. Montgomery	Gynecological clinic, Nov. 7, 10, and 14, 11 A. M.
P. B. Bland and F. H. Maier	Gynecological clinic, Nov. 8, 9, 11, 13, 15, and 16; 11 A. M.
S. L. Ziegler and P. J. Pontius	Ophthalmological clinic, Nov. 8, 10, and 15, 4 P. M.
Dr. Jones	Ophthalmological clinic, Nov. 9, 11, 14, and 16, 4 P. M.
G. M. Marshall	Ear, nose and throat clinic, Nov. 7, 8, 11, 14, and 15, 9 A. M.
Dr. Senders	X-ray clinic. Daily at noon.

HOWARD HOSPITAL

Barton Cooke Hirst	Gynecological clinic; Nov. 7, 11 and 14; 12:30 P. M.
Alfred C. Wood	Surgical clinic; Nov. 8 and 15, 12:30 P. M.
W. C. Posey	Ophthalmological operations; Nov. 13, 2 P. M.
George B. Wood	Tonsillectomy; accessory sinus disease; straightening of crooked nasal septum; mastoid operation, etc.; Nov. 9 and 16, 2 P. M.

WILLS EYE HOSPITAL

P. J. Pontius, M. Radcliffe, S. L. Ziegler, C. Berens, S. D. Risley, F. Fisher, W. C. Posey, P. N. K. Schwenk and W. Zentmayer	Operative clinics daily; 2 to 3 P. M.

JEWISH HOSPITAL

L. W. Steinbach	Surgical clinic; Nov. 9, 11 A. M.
Isaac Leopold	Ophthalmological clinic; Nov. 14, 3 P. M.
W. H. Teller	Surgical clinic; Nov. 14, 11 A. M. to 1 P. M.
Walter G. Elmer	Orthopedic clinic; Nov. 9, 12 M.
Melvin M. Franklin	Surgical clinic; Nov. 9, 1 to 3 P. M.
Jay C. Knipe	Ophthalmological clinic; Nov. 8, 2 P. M.
S. MacCuen Smith	Surgery of the ear; Nov. 9, 3 to 5 P. M.
M. J. Stern	Surgical clinic; Nov. 14, 1 to 3 P. M.
Eli Klopp	Surgery of the ear; Nov. 14, 4 P. M.
A. W. Watson	Nose and throat clinic; Nov. 8, 3 to 5 P. M.

PHILADELPHIA LYING-IN CHARITY HOSPITAL

G. M. Boyd	Obstetrical clinic; Nov. 10, 12 to 1.
Stricker Coles	Obstetrical clinic; Nov. 14, 12 to 1.

CHILDREN'S HOSPITAL

H. R. WHARTON	Surgical clinic. Nov. 7.
F. R. PACKARD	Nose and throat clinic. Nov. 8.
B. A. RANDALL	Ear clinic. Nov. 9.
J. H. JOPSON	Surgical clinic. Nov. 10.
W. C. POSEY	Eye clinic. Nov. 11.
E. B. HODGE	Surgical clinic. Nov. 13.
F. K. KNOWLES	Surgical skin affections. Nov. 14.
C. Y. WHITE	Surgical pathology. Nov. 16.

STETSON HOSPITAL

LEWIS S. SOMERS	Ear, nose and throat clinic; Nov. 8 and 13; 12 to 1.
ISAAC LEOPOLD	Eye clinic; Nov. 10 and 14; 12 to 1.
STEPHEN E. TRACY	Catheterization of ureters; Nov. 8, 12:30 to 1:30. Gynecological clinic (days to be announced later).
JOHN A. BOGER	Surgical clinic; Nov. 13 and 15; 1.
B. M. ANSPACH	Gynecological clinic; Nov. 7, 9, 11, 14; 12 to 1.
W. B. ODENATT	Case of enlarged thymus in child of four months; case of situs viscerum inversus; intragastric faradism in gastric atony; Nov. 8 and 11; 12 to 1.
CARLE LEE FELT	Ear, nose and throat clinic; Nov. 9 and 14; 12 to 1.
GEORGE G. ROSS	Surgical clinic; Nov. 7, 9, 11, and 14; 12 to 1.

EPISCOPAL HOSPITAL

H. C. DEAVER	Surgery of the female pelvis. Nov. 7, 2 to 4 P. M.
LOUIS MUTSCHLER	Surgery of hernia. Nov. 8, 2 to 4 P. M.
G. ORAM RING	Surgery of the eye. Nov. 10, 2 to 4 P. M.
CHARLES H. FRAZIER	Surgery of the stomach and duodenum. Nov. 11, 2 to 4 P. M.
C. Y. WHITE	Vaccine therapy. Nov. 13, 2 to 4 P. M.
C. C. BIEDERT	Surgery of the ear, nose and throat. Nov. 14, 2 to 4 P. M.
A. P. C. ASHHURST	Operative treatment of fractures of the femur. Nov. 15, 2 to 4 P. M.
J. L. BROMLEY	Ophthalmological clinic. Nov. 16, 2 to 4 P. M.

KENSINGTON HOSPITAL

H. C. DEAVER	Abdominal surgery; Nov. 9 and 13, 2 to 5 P. M.

HAHNEMANN HOSPITAL

Surgical Clinics — Nov. 8 and 15, 3:30.

W. B. VAN LENNEP	Prostatectomy; hernia.
H. L. NORTHROP	Goiter; appendix.
G. A. VAN LENNEP	Stomach and gall-bladder.
H. P. LEOPOLD	Open treatment of fractures.
W. N. HAMMOND	Club foot; tendon transplanation.
J. D. ELLIOTT	Breast tumors.
C. A. BIGLER, JR.	Hæmorrhoids; fistula; other current clinical material.

Gynecological and Obstetrical Clinics—Nov. 11 and 16, 3:30.

D. B. JAMES	Pelvic inflammatory disease; fibroids.
N. F. LANE	Uterine displacements.
J. E. JAMES, JR.	Obstetrical demonstration; repair of genital canal.

Eye, Ear, Nose and Throat Clinics—Nov. 8, 11, and 15, 3:30.

W. W. SPEAKMAN	Operations on the eye.
F. W. SMITH and OSCAR SEELEY	Demonstration of tracheo-bronchoscopy and œsophagoscopy.
I. G. SHALLCROSS and H. S. WEAVER	Surgery of the accessory sinuses; nose and throat clinic.
G. J. PALEN	Radical mastoid operation.